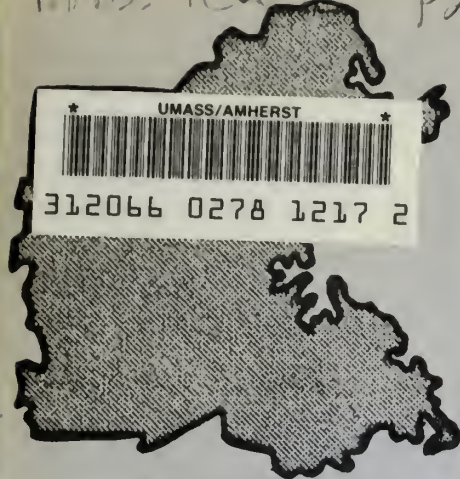
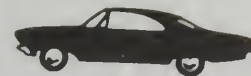


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EASTERN MASSACHUSETTS REGIONAL PLANNING PROJECT



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METRO AREA PLANNING COUNCIL

Massachusetts Department of Public Works
Bureau of Transportation Planning and Development
100 Nashua Street, Boston, Massachusetts

REGIONAL PARKING ANALYSIS
March 1969

in cooperation with the
Massachusetts Department of Commerce and Development
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and with the

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SUMMARY

This report provides an overview of the estimated present and future parking demands of the Eastern Massachusetts Region.

Analysis indicates that in some areas of the region parking might well become a critical factor in the proper functioning of the future transportation system. Eight study areas were selected from the following communities: Boston (Boston Proper and Fenway-Jamaica Plain), Brockton, Cambridge, Lawrence, Lowell, Lynn and Quincy.

Boston Proper⁽¹⁾ stands out as one of the areas where the planned highway system will be most affected by future parking availability. The estimated future auto trips for Boston Proper were used to determine the 1990 demand for

(1) See Appendix A "Boston Proper"

parking spaces which showed a need of 119,088 spaces for Plan A⁽²⁾ and 110,562 spaces for Plan C⁽³⁾. Based on these projected auto trip estimates, the downtown core highway system in 1990 could be completely strangled by over 50,000 additional cars seeking a place to park. These deficiencies would be even greater if a significant number of the present (14,722)⁽⁴⁾ curb spaces were eliminated.

The 1963 estimated peak demand of 49,096⁽⁵⁾ spaces, as compared to the 47,920 spaces actually inventoried in 1966⁽⁶⁾, demonstrates the existing critical aspect of parking in this core area. Today the demand already exceeds the supply and may be one of the prime causes of the present street congestion in the downtown area. The lessening of street congestion may be accomplished by eliminating on-street parking; however, this would remove 14,722 curb spaces and increase the parking space deficiency as related to the demand. The total elimination of on-street parking appears remote in that in this report an analysis of 1963 parking demand by type revealed that 44% of the downtown parking was on-street,

(2) Plan A - Composite Plan (See EMRPP - Recommended Highway and Transit Plan)

(3) Plan C - Controlled Dispersal Plan (See EMRPP - Recommended Highway and Transit Plan)

(4) "1966 BRA Curb and Off-Street Parking Inventories"

(5) See Appendix A

(6) "1966 BRA Curb and Off-Street Parking Inventories"

while 45% was off-street lots and only 11% garage parking.

The Cambridge and Fenway-Jamaica Plain study areas may also succumb to this critical parking situation; however, detailed analysis was not undertaken due to a lack of present parking supply data.

In addition to the highway oriented parking, transit related parking facilities for the entire EMRPP were analyzed. The 1990 projected parking demand at transit stations shows a need for 71,271 spaces in Plan A and 42,376 spaces in Plan C. These figures, when compared to the 1964 existing supply of 17,740 spaces at present transit stations, illustrates an enormous parking problem. Unless these transit related parking demands are satisfied, additional pressures for parking downtown will occur and the downtown circulation system will become even more congested than today.

The study of the 'outer' communities such as Brockton, Lowell, Lawrence, Lynn and Quincy indicated a decrease in the 1990 highway oriented parking demand. This demonstrates that the outer communities destination trips or parking demand may not be as critical as in the 'inner' communities. However, the problem of transit related parking facilities must be a prime consideration of the 'outer' communities

Regionally the 1963 peak auto parking accumulation occurred at 10:00 AM with a space demand of over 111,000 for the eight study areas. The total 24 hour trips by purpose for the study areas revealed a total of 415,043 of which 40.7% were work trips and 34.9% were non-work trips, while the remaining 24.4% were 'other' trips which did not have a parking need.⁽⁷⁾

The analysis of the 24 hour parking demand by type showed lot parking comprising 51.8% of total parking and street parking 43.4%. Garage parking constituted only 4.8%.⁽⁷⁾ Of the total 24 hour demand of 343,840, 75.2% was free parking, leaving approximately 25% as fee paid parking.⁽⁷⁾

The 1963 and 1990 estimated parking space demands were derived by the space estimating factor technique explained in Chapter III. The estimate obtained showed an average growth of more than 40% in the selected study areas. Growth rates for individual selected study areas differed from a 60% increase to a 50% decrease in parking demands. The most significant result of the 1963 to 1990 comparisons was the increased demand shown in the selected zonal study areas of the 'inner' communities of Boston (Boston Proper and Fenway - Jamaica Plain) and Cambridge while the selected zonal study areas of the 'outer' communities of Brockton, Lowell, Lawrence,

(7) See Chapter IV

Lynn and Quincy showed decreasing demands. This phenomenon is further discussed in the report.

The impact of future parking requirements in the region will be significant for both the urban and suburban areas. Therefore, it is recommended that auto parking be a prime consideration in all future land development and redevelopment programs. The most important recommendation is that each community, based on the data in this report, undertake a more detailed study of its own parking situation as related to the regional forecast of travel.

CHAPTER I

INTRODUCTION

1. Background

The future adequacy of parking or terminal facilities not highway capacity, may well be the critical and limiting factor in meeting the motoring public's needs in metropolitan regions. Even though well planned and adequate capacity highways are a region's lifelines, the motor vehicle requires more than this ribbon of pavement. It requires a storage space for each journey's origin and destination. It is this storage space or parking facility that is examined in this report.

2. Purpose

A community by community inventory of parking facilities in the Eastern Massachusetts region is not the intent of this report. The purpose of this report is to analyze

the existing⁽¹⁾ and projected⁽²⁾ motor vehicle trips to provide a picture of the parking needs of the region. In addition, basic parking characteristics such as existing and projected parking demand, peak hour demand, parking type usage, parking trip purpose, etc., will be developed and reported.

3. Scope

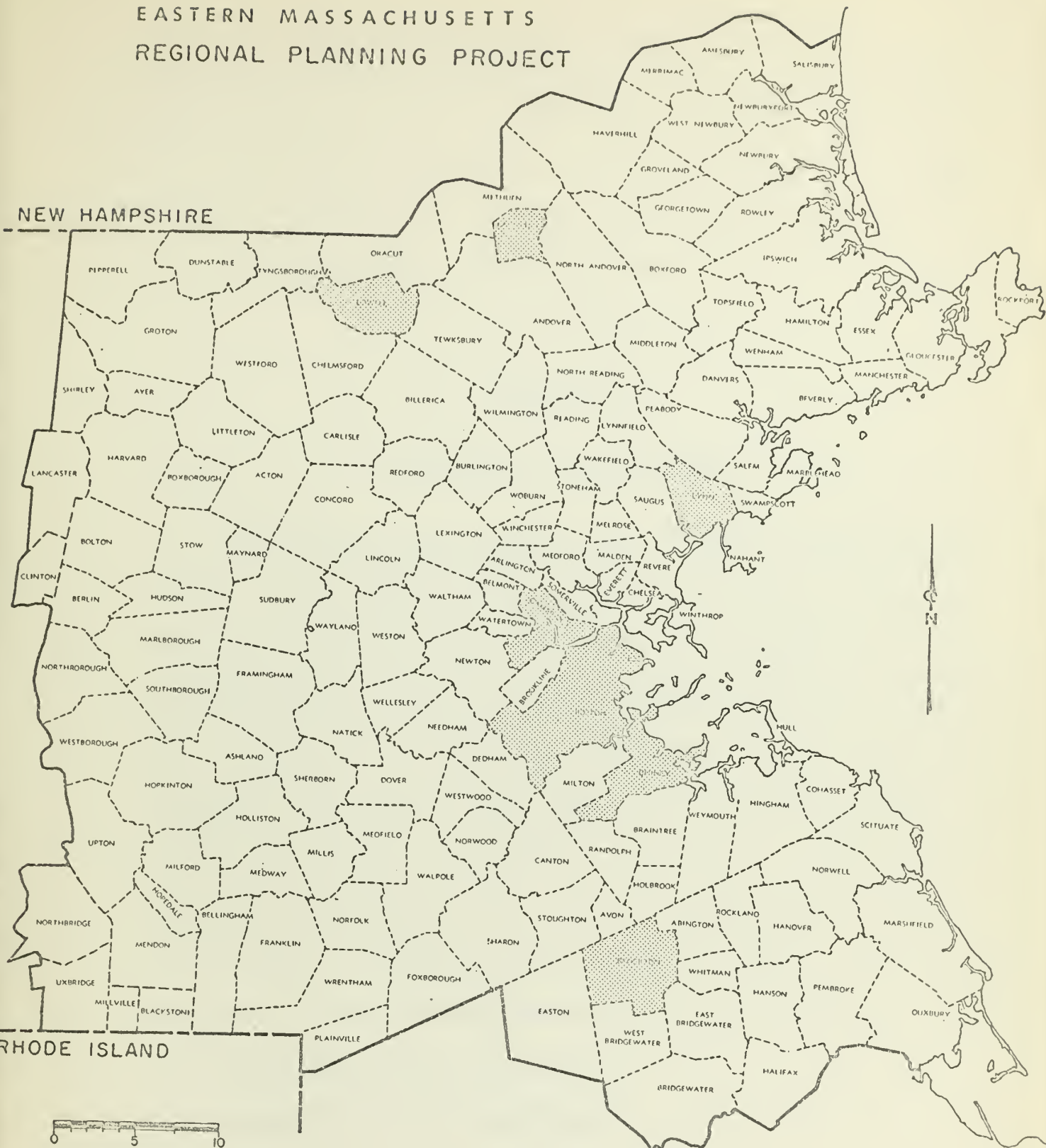
The Eastern Massachusetts Regional Planning Project encompasses 152 communities in eastern Massachusetts (See map). However, the analysis of motor vehicle trips for parking is not necessary for all communities. Because of a rural of semi-developed nature, most of these 152 communities do not generate significant trip activity to create parking demand of regional impact. Therefore, only the larger densely developed urban core communities are considered for analysis. The major effort of analysis is in Boston, because of its size and core city function in the region.

(1) Existing motor vehicle trip data is the data obtained by the 1963 Dwelling Unit Survey

(2) Projected motor vehicle trip data is the 1990 projected data developed by Eastern Massachusetts Regional Planning Project

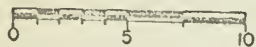
EASTERN MASSACHUSETTS REGIONAL PLANNING PROJECT

NEW HAMPSHIRE



N

RHODE ISLAND



SCALE IN MILES

Study
Communities



MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS
MASSACHUSETTS DEPARTMENT OF COMMERCE AND DEVELOPMENT
In cooperation with the
Urban Renewal Administration of the Department of
Housing and Urban Development
and the United States Department of Commerce, Bureau of Public Roads

CHAPTER II

SELECTION OF STUDY AREAS

The Eastern Massachusetts area, a large complex urban area of 2,300 square miles, comprised 152 cities and towns in 1963. This area supported 3,600,000 residents who each day made over 8,000,000 trips in automobiles, taxis, buses, street-cars, rapid transit and commuter railroad trains. However, since much of this high level of activity takes place in relatively few areas of the region, it was necessary to define these areas. Since concentration of urban activities is one determinant of parking needs, a method was devised to locate those concentrated areas yielding the highest levels of parking activities.

1. Minimum Community Population

The most obvious element in determining urban activity is total population. The initial selection of concentrated

urban areas was based on those communities with a total population of more than 30,000. This selection yielded 22 communities ranging in population from 33,000 to 697,000. Preliminary review of these 22 communities indicated that additional factors should be considered in selecting study areas.

2. Auto Driver Trip Activity

Since parking relates directly to the use of motor vehicles an examination of the number of trips made was undertaken. The examination revealed that not all motor vehicle trips - such as taxis, auto passenger, etc. - require parking space. Therefore, only the auto driver trip category was considered as having a direct effect on parking needs.

Based on this assumption, the auto driver trips were selected for these 22 communities from the auto vehicle trip data tapes.⁽¹⁾ The data selected were sorted by town, zone and subzone and then printed to determine the need for additional editing. This editing process resulted in obtaining a data tape free of errors.

This new data tape was again processed to obtain a printout tabulating several trip purposes to each of the zones in the 22 communities. This printout was then analyzed to

(1) Eastern Massachusetts Regional Planning Project Data Tapes from Home Interview Origin and Destination Study or Dwelling Unit 5 survey.

determine the communities having the most trip activity. Seven communities and two sectors of Boston had more than 100,000 trips.

3. Trip Criteria

A review of trip activity in all 22 communities revealed that only communities of over 100,000 trips should be considered for additional scrutiny in determining study areas for parking analysis.

The following communities were selected.

<u>Community</u>	<u>Total 'In' Trips</u>
1. Boston Sectors	
1) Boston Proper	136,422
2) Fenway-Jamaica Plain	101,065
2. Brockton	133,514
3. Cambridge	137,885
4. Lawrence	109,102
5. Lowell	107,415
6. Lynn	126,266
7. Newton	147,686
8. Quincy	121,020

4. Trip Concentration Selection

These eight selected communities were further analyzed on a zone by zone basis in order to determine the areas within each community having the greatest concentration of trip activity. The final tabulation listed the total number of auto driver trips destined for each zone. To devise a trip distribution in each of the communities a comparison or ratio was made of the zone total to the community total.

This percentage indicated the level of trip concentration for each zone. Each zone was then examined to determine its relative need for parking based on the zone size, land use activity and the number of trips by purpose.

This final examination led to the selection of 57 zones in seven of the eight communities or areas with more than 100,000 trips. Newton, which had the greatest total community 'in' trips, was eliminated because of the area of the zones and the fact that no one zone appeared more concentrated than any other.

The 57 zones selected make up only a small part of the eight communities; however, in each community the selected zone or zones generally represent the Downtown Business Area. The detailed location of the selected zones can be found on the community maps in the Appendices.

CHAPTER III

METHODOLOGY OF STUDY

A typical parking report prepared for an urban transportation study requires several unique inventories. This parking report for the EMRPP Region will not be typical in that these unique inventories were not undertaken. Therefore, it was necessary to employ other techniques for deriving data to produce an image of the region's present and future parking requirements.

The methodology developed was predicated on the assumption that definable relationships exist between parking demand and travel (trip) characteristics.

1. Source of Data

The source for the data used in this study was obtained from the 1963 Dwelling Unit Survey conducted by Wilbur Smith and Associates for the EMRPP.

In the Dwelling Unit Survey, the type of parking used at destinations of auto driver trips was obtained for ten categories of parking facilities. These included street parking free, meter and cruising; and off-street parking in pay or free lots or garages, services or repairs or place of residence. Data also included vehicles 'not parked'. These ten categories were summarized for all 152 communities in the region. From the basic parking data and additional trip characteristics, such as number of trips, time and purpose of trip, several parking characteristics were developed to allow for a regional analysis of parking requirements.

2. 1963 Hourly Parking Space Demand

Estimating 1963 parking demand for each of the 57 zones was the first step. The technique for developing this estimate was based on the assumption that auto driver trip accumulation in these zones would be equal to and represent the estimated demand. This accumulation was calculated by comparing the hourly 'ins' over the hourly 'outs' for trips for each zone.

In the preparation of the accumulation table, work and non-work trips were tabulated separately so that the time difference for the two accumulations could be evaluated. Therefore, the auto driver trips were tabulated in these major categories by purpose: work - a trip made to a zone

for the purpose of working; non-work - a trip made to a zone for one of the following purposes: personal business, recreation, school, social, shopping convenience, and shopping G.A.F. (Goods); and other - a trip made for the purpose of changing travel mode, serving a passenger or to home. This breakdown was necessary since work trips generally result in all day parking while non-work trips vary from a very short time to all day. The other trips do not normally require parking facilities, and therefore were not considered except to indicate their relative value in each study area.

The hourly auto accumulations for both work and non-work purposes were calculated, as illustrated by the sample zone in Table 3-1. The accumulations were evaluated for both purposes and then a combined accumulation was calculated which is also shown in Table 3-1. This combined auto accumulation constituted the estimated 1963 parking demand for each of the study zones.

3. 1990 Estimating Parking Procedure

Estimating the 1990 parking demand required that the 1963 estimating technique be further refined so as to develop a space estimating factor. This factor was derived by dividing the highest auto accumulation by the total 'ins'.

$$\frac{\text{Combined Zonal 1963 Auto Accumulation}}{\text{Total 'Ins' (1963 Total)}} = \text{Parking Space Estimating Factor}$$

TABLE 3-1

1963 HOURLY AUTO ACCUMULATION
ZONE: SAMPLE

Time	In	WORK Accumu- lation	Out	In	NON-WORK Accumu- lation	Out	Combined Hourly Accum.
0000	35.8	35.8					35.8
0100							
0200							
0300				16.8	16.8		16.8
0400							
0500	53.2	89.0					89.0
0600	207.9	296.9		38.0	54.8		351.7
0700	434.6	695.9	35.6	145.5	164.5	35.8	860.4
0800	1362.4	1790.0	268.3	313.2	331.6	146.1	2121.6
0900	955.5	2468.0	277.5	930.0	993.4	269.1	3461.4
1000	168.9	2297.3	339.6	1319.8	1483.9*	829.3	3781.2
1100	258.8	2369.0	187.1	837.3	1018.3	1302.9	3387.3
1200	135.7	2170.5	334.2	818.8	1020.3	816.8	3190.8
1300	470.3	2497.2*	143.6	1294.4	1376.1	938.6	3873.3*
1400	243.3	2386.3	354.2	834.8	1077.3	1133.6	3463.6
1500	251.4	2111.0	526.7	979.7	790.6	1266.4	2901.6
1600	278.5	1812.1	577.4	848.9	528.3	1111.2	2340.4
1700	216.9	820.3	1208.7	504.4	443.7	589.0	1264.0
1800	129.3	626.1	323.5	758.5	801.0	401.2	1427.1
1900	40.9	629.8	37.2	1174.5	1260.6	714.9	1890.4
2000	75.7	608.3	97.2	542.2	902.3	900.5	1510.6
2100	50.4	369.4	289.3	107.4	358.2	651.5	727.6
2200		208.3	161.1	15.7	143.6	230.3	351.9
2300		191.4	16.9		0.0	143.6	191.4
Tot.	5369.5		5178.1	11480.8		11480.8	

*Highest Zonal Accumulation

Since the 1990 trip data is available only as zone total 'ins' and not highest accumulation, the individual use of work and non-work parking space estimating factors was not possible. The space estimating factor derived by this technique may appear to be similar to what constitutes the reciprocal of the turnover rate. However, actual supply of spaces is not used. Instead the peak accumulation, as determined above, is used which in effect gives a turnover ratio based on demand of spaces instead of supply of spaces.

The 1990 estimated parking demand was calculated in the following manner.

(Total 1990 Zonal 'Ins' all trip purposes) x (Parking Space Estimating Factors) = Estimated 1990 Parking Space Demand.

The above technique for estimating 1990 parking demand was based on an assumption that the same ratio of auto driver trips requiring parking spaces for each zone will exist in 1990 as existed in 1963. Accepting the above assumption, a comparison can be made of the 1963 estimated demand to the 1990 estimated demand to provide an image of the future parking needs in critical areas of the EMRPP Region.

4. Other Data

In addition to estimating parking demand, data was developed to indicate 1963 parking characteristics such as

24 hour parking demand by type, hourly parking demand by purpose, parking by trip purpose and type of facility used.

CHAPTER IV

ANALYSIS

The analysis and recommendations for this parking study are regionally oriented. To develop a regional picture, however, individual community analysis was necessary. This individual community data is included in Appendices A thru G of this report.

The intent of the analysis is not to provide parking inventories for all 152 communities, but to present the regional view of parking on the basis of several selected areas which are considered to reflect the critical parking problems of the region.

1. 1963 Estimated Parking Demand

Based on the accumulated hourly parking demand of all the selected zonal study areas, the region's peak demand occurred at 10:00 AM. (See Table 4-1). The greatest

TABLE 4-1
ZONAL AUTO ACCUMULATION

Time	Boston	Brockton	Cambridge	Fenway-JP	Lawrence	Lowell	Lynn	Quincy	Regional Total
0000	2147	71	181	93	175	251	21	36	2975
0100	497			231	35	107	40		910
0200	680		78	16		64	80		918
0300	536	55	150	132	157	170		17	1217
0400	894	59	229		157	68			1407
0500	2302	142	563	154	277	462	165	89	4154
0600	5640	495	2081	927	1514	726	2317	352	14052
0700	16182	2030	6984	5178	3593	2819	6260	860	43906
0800	32479	3869	14298	12746	5418	4466	8756	2122	84154
0900	38851	4288	18584	16999	6114	5377	9750	3461	103424
1000	43801	4465*	19591*	17651*	6276*	5534*	10130	3781	111229*
1100	44845*	4411	18878	17070	5958	5520	9753	3387	109822
1200	41774	4010	18625	16472	5538	4834	9722	3191	104166
1300	42149	4056	18532	16217	6001	5355	10246	3873*	106429
1400	41800	4275	17737	15398	5927	5083	10627*	3464	104311
1500	39687	3731	16441	13202	5040	4635	7574	2902	93212
1600	27456	2676	11887	7866	3450	3029	4594	2340	63298
1700	12830	861	5690	5306	1520	1350	2070	1264	30881
1800	11643	847	3866	5532	1803	1561	2466	1427	29145
1900	12282	1710	4601	7087	2562	2128	2596	1890	34856
2000	11628	1537	4775	6455	2308	1794	2589	1511	32597
2100	9638	1200	3150	3379	1673	1088	1922	728	22778
2200	6208	520	2415	1771	1044	659	889	352	14858
2300	3507	206	1406	256	541	680	444	191	7231

*Highest Hourly Demand

variation from the regional peak demand time was in Lynn and Quincy. The total space demand for the selected study areas at the peak period was over 111,000.

2. 1963 Parking Demand by Type

The total 24 hour parking space demand for the selected study areas was 343,840. (See Table 4-2). The analysis of this total indicates that lot parking (51.8%) comprised the greatest amount, closely followed by street parking (43.4%). On a selected regional basis, garage parking (4.8%) was relatively insignificant, with Boston Proper essentially the only area indicating some significance in garage facilities.

The analysis showed that free parking (nearly 75%) is the most common type.

3. 1963 Trip Purposes Requiring Parking

The analysis (by purpose) of trips requiring parking revealed that the amount of work and non-work trips were nearly equal in the region (See Table 4-3). The number of work trips was greater, representing 40.7%, while non-work constituted 34.9% of the total. Of the non-work trips, the 'Personal Business' purpose was the most significant. The 'other' trips amounted to 24.4% of the total trips to the study areas.

This distribution of trips requiring parking indicates that parking facilities should be planned so that more spaces

TABLE 4-2

1963 24 HOUR PARKING USAGE BY TYPE

COMMUNITY	NUMBER BY TYPE									
	Street		Lot		Garage		Total		Total	
	Free	Paid	Free	Paid	Free	Paid	Free	Paid	Free	Paid
Boston	43339	8402	51741	31512	21494	53006	1677	10928	12605	117352
Proper										
Fenway-JP	17080	1983	10963	24785	4127	28912	425	619	1044	49019
Brockton	6109	3016	9125	9664	851	10515	153	65	218	19858
Cambridge	22081	6823	28904	24761	3602	28363	740	909	1649	58916
Lawrence	9472	4678	14150	12807	1428	14235	228	279	507	28892
Lowell	7077	3624	10701	10514	1475	11989	75	49	124	22814
Lynn	4243	3469	7712	19883	1741	21624	112	35	147	29483
Quincy	3370	4602	7972	8338	1089	9427	109	--	107	17506
Total	112771	36597	149368	142264	35807	178071	3519	12884	16401	343840
% of Total	32.8	10.6	43.4	41.4	10.4	51.8	1.0	3.8	4.8	

TABLE 4-3

1963 TRIPS BY PURPOSE TO STUDY AREAS

COMMUNITIES	WORK			NON-WORK					Non-Work Total	OTHER
	1	Per Bus 2	Rec 3	Sch 4	Soc 5	Shop Conv 7	Shop GAF 8			
Boston Proper	70538	13875	4856	2821	5548	2941	6266	36307	29454	136299
Fenway-JP	19701	6173	2361	9120	3275	920	2219	24068	12841	56610
Brockton	8462	3663	952	16	1270	1950	3122	10973	7985	27422
Cambridge	28432	6936	1545	2430	3204	3121	3619	20855	21455	70742
Lawrence	10948	5036	1123	240	1872	3341	3698	15310	11170	37428
Lowell	9079	4682	772	106	941	2290	3543	12336	7423	28838
Lynn	16206	4327	1551	125	928	2092	4699	13722	6737	36664
Quincy	5369	2946	287	270	482	1758	5738	11481	4191	21041
TOTAL	168735	47638	13447	15128	17520	18413	32904	145051	101256	415043
% of TOTAL	40.7	11.5	3.2	3.7	4.2	4.4	7.9	34.9	24.4	

be devoted to all day parking than for shorter term parking. A possible ratio that might be considered would be three quarters for work (with a turnover rate of approximately 1.0) and one quarter for non-work (with a turnover rate of approximately 3.0).

4. 1990 Estimated Parking Demand

Based on the method described in Chapter III the 1990 estimated parking demands were calculated. At that time two alternative network highway plans for the region existed. Therefore, Table 4-4 illustrates two 1990 estimated parking demands for each selected study area and for the region. A more detailed description of both plans can be found in the final report entitled "Recommended Highway and Transit Plan", (1968 - EMRPP by Massachusetts Department of Public Works).

5. Analysis of 1990 Estimated Parking Demand

The analysis provided several important indications as to the future impact of parking needs in the selected study areas.

The combined 1990 space demands for the study areas in the region projected a growth of approximately 50% for parking facility needs in 1990. The most striking revelations were in the selected study areas of the 'outer' communities where the projection for 1990 showed a reduction in the need for parking demand, while the selected study areas in the

TABLE 4-4

ESTIMATED 1963 AND 1990 PARKING SPACE DEMAND

<u>COMMUNITY</u>	<u>1963</u>	<u>1990A</u>	<u>NUMBER DIFFERENCE</u>	<u>% CHANGE</u>	<u>1990C</u>	<u>NUMBER DIFFERENCE</u>	<u>% CHANGE</u>
Boston Proper	49091	119088	69997	143%	110562	61471	125%
Fenway-JP	17784	21634	3850	22%	21417	3633	20%
Cambridge	19954	21124	1170	6%	22591	2637	24%
Brockton	4465	2824	-1641	-37%	2822	-1643	-37%
Lawrence	6275	3054	-3221	-51%	3083	-3192	-51%
Lowell	5614	4351	-1263	-22%	4288	-1326	-24%
Lynn	10640	8331	-2309	-22%	8389	-2251	-21%
Quincy	3873	2908	-965	-25%	2931	-942	-24%
TOTAL	117696	183314	65618	55.75%	176083	58387	49.6%

'inner' communities showed increases. The study area of Boston Proper showed the greatest growth with around 130.0% increase for 1990. This phenomenon of reduction in the selected study areas of the 'outer' communities was further analyzed by estimating the parking demand for each entire community. As a whole, the individual community gained in parking demand indicating that the suburban shopping centers were projected to grow while the downtown areas, which in most areas constituted the selected study areas, would decline. This significant decline has its basis in the fact that the 1990 travel and parking projections were based on growth trends from 1952 to 1963. Therefore, if the trends of that period continue, the above mentioned declines could likely occur.

CHAPTER V

TRANSIT RELATED PARKING

1. INTRODUCTION

Studies of parking related to transit have shown that park-ride trips (persons changing from auto to transit) are generally destined for downtown Boston. Investigation of park-ride demand is necessary for both transit planning and the effect of diverting downtown auto trips to park-ride transit trips.

The Corridor Traffic Models used in system planning studies require information on the access to transit stations by various travel modes. The presence of parking facilities and the use made of transit lot capacity is information needed to carry out responsible transportation system planning studies.

Investigation of transit related parking consisted of determining the 1967 supply of MBTA parking and the fore-

casted demands based on the 1990 alternate transit networks. Also, 1964 commuter railroad parking figures for Boston & Maine and New Haven railroad parking were obtained from the 1963-64 Comprehensive Traffic and Transportation Inventory, Boston Regional Planning Project, while the 1990 data was obtained from forecasts prepared by Peat, Marwick, Livingston and Co. for EMRPP.

The 1967 MBTA parking supply data was obtained from an aerial photo survey of MBTA parking facility usage.

Please note that the transit related parking demand figures are not included in the strictly auto related parking covered in Chapters I-IV.

2. 1967 TRANSIT RELATED PARKING

In 1967 the MBTA conducted an aerial photo survey of all parking related to rapid transit stations.

Vertical aerial photos were taken of 49 rapid transit stations in a flight plan that covered all stations within thirty minutes. Passes were made at different periods during the day to determine turnovers. The aerial photo survey was augmented with field visits to each station site. The MBTA parking survey data was analyzed to determine the effect of lot size, walking distance, lot location, and arrival time (before or after 9:00 AM) on parking demand.

The MBTA operates 32 parking lots at twenty-three (23)

transit stations (Riverside, Woodland, Waban, Eliot, Chestnut Hill, Brookline Village, Forest Hills, Mattapan, Central Avenue (Milton), Milton, Butler, Cedar Grove, Ashmont, Columbia, Lechmere, Sullivan Square, Everett, Airport, Wood Island Park, Orient Heights, Suffolk Downs, Beachmont and Wonderland). Twenty-three of the MBTA operated lots are pay lots with fees ranging from 10¢ to 60¢ per day. Nine of the MBTA operated lots are free.

In addition to the above lots, there are thirteen (13) pay parking lots privately operated with fees ranging from \$3/month to 75¢/day. The off-street parking capacity at MBTA transit stations (MBTA and privately operated lots) is 9,500 spaces with an average occupancy of 80%.

In addition to the off-street parking, this survey indicated curb parking capacity of some 970 spaces with an average use of 86%.

As a result of the 1964 Wilbur Smith & Associates survey it was determined that the Boston & Maine and New Haven Railroads had a combined parking lot supply of 7,270 spaces which served 10,000 auto trips (park-ride and kiss-ride combined) to the stations (all area railroads). Therefore, combining rapid transit and commuter rail parking spaces yields total transit parking of 17,740 spaces. (Spaces that may be provided by the New York Central Railroad were

not included.)

Surveys were conducted by the MTC to determine if lot usage could be increased due to parking lot fee reduction. The fee reduction reversed the utilization trend and a 60% net increase occurred. This, together with the transit aerial survey analysis of walking distance from parking lot to station, indicates that transit related parking use would be increased if parking fees are low and lots are convenient.

3. 1990 TRANSIT PLANS

TRANSPORTATION PLAN A

The 1990 Plan A transit system was divided into three sectors (North, West and South) for the purpose of analyzing transit related parking. The North Sector included the Wilmington line (13,967 spaces), the combined Beverly and Revere lines (8,061 spaces), and the Harvard line (387 spaces). These make a total of 22,415 demand spaces in the North Sector.

The West Sector included the Lexington line (14,113 spaces) and Framingham (9,349 spaces) lines totaling 23,462 spaces. The South Sector includes Sharon and others (11,849) and the South Shore Rockland and Avon lines (13,545), making a South Sector total of 25,394 spaces.

This summarization of parking space demand reveals that the South Sector will have the greatest demand with 35.6% while the North and West will be nearly equal, 31.5% and 32.9%.

TRANSPORTATION PLAN C

Dividing the 1990 Plan C transit system into three sectors, as was Plan A, reveals the following figures. The North Sector, which includes Revere (5,541), Malden (8,354) and Harvard (441) makes a sector total of 14,336 spaces. The West includes Cambridge (6,776) and Newton (5,937), totaling 12,713 spaces. The South Sector lines had a total of 15,327 spaces. The South Sector lines in Plan C also showed the largest demand for the area with 36.2% of the total. North and West were 33.8% and 30.0% respectively.

4. 1990 TRANSIT RELATED PARKING DEMAND

The 1990 parking demand at transit terminals was tabulated for the two alternate future transit systems. Transportation Plan A showed a demand of 71,271 spaces while Transportation Plan C showed a demand of 42,376 spaces.

CHAPTER VI

RECOMMENDATIONS

The analysis of the 1963 and the 1990 estimated data indicated several problems in future regional parking needs. Therefore, the following recommendations for the region are proposed.

- a. That any redevelopment projects in the EMRPP region make parking facilities (off-street) a prime consideration. Therefore, it is strongly recommended that in the 'inner' communities of Boston Proper, Cambridge and Fenway-Jamaica Plain a program of continuous evaluation be instituted for determining their future parking needs. Also the 'outer' communities must realize the significance of parking in their renewal plans and also continue to evaluate their parking needs so as to

stem the tide of decreased activity in their downtown areas.

- b. That prior to the elimination of any present off-street parking, future parking needs in the area should be given due consideration. This is recommended for all areas of the region.
- c. That if peripheral parking to the downtown exists or is planned adequate signs should be erected to direct the driver to the lot.
- d. That some of the free parking should become paid parking so that more control will be available to regulate the parking needs of the downtown business area. The paid or metered lots based on time parking will create more turnover parking providing better interchange of lot use for the downtown area.
- e. That new construction in all areas should be required to provide the necessary off-street parking. This would be especially true in the suburban communities where shopping centers are proposed. The parking for these activities are the responsibility of the builder, not the local community. The implementation of this recommendation may be accomplished through by-laws or ordinances.

f. That in the densely urban areas the region should consider the use of multilevel garage form of parking. At present little use of garages is being made except in Boston. The implementation of this recommendation may be accomplished through by-laws or ordinances.

In general from all the projections the EMRPP region in 1990 will have more cars needing more space to park. The impact on the region will be large and needs close inspection and review. Therefore this report should be considered a beginning in that each community should now undertake a program to study and determine its individual conditions in relationship to the regional image provided in this report.

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APPENDIX A

BOSTON (Boston Proper and Fenway-Jamaica Plain)

Boston, the central city of the Eastern Massachusetts Region, had a 1960 population of 697,197. It is the dominant city in New England and the center of banking, commerce and industry in the region.

Because of the size and activities of the city, it was subdivided into thirteen sectors. The sector analysis of auto driver trip destinations revealed that only two sectors (Boston Proper and Fenway-Jamaica Plain) had large requirements for parking demands.

All forty two zones in Boston Proper along with four zones in Fenway-Jamaica Plain were selected for study. (See map, pages A5 and 39) Of all auto driver trips to the forty two zones in Boston Proper, more than 78% of them required some form of parking. The four selected zones in Fenway-

Jamaica Plain attracted about 70% of all trip destinations requiring some form of parking in the Fenway-Jamaica Plain community.

The Boston Proper sector represents the major area of the business and shopping activities in the city. The Fenway-Jamaica Plain selected zones contain several colleges, Fenway Park, Kenmore Square and the Art Museum, all of which generate large parking demands. The remaining eleven sectors of the city consist of mixed uses which were dominated by residential activities.

1. BOSTON PROPER

INTRODUCTION

Boston Proper is the core business and entertainment area in the city of Boston. Its boundaries are the waterfront on the east, Charles River on the north, Massachusetts Avenue on the west and the Southeast Expressway on the south. Boston Proper can be assumed to represent the Central Business District of the eastern Massachusetts region. The area is composed of forty-two zones (012-053).

Of these forty-two zones the following twelve indicated strong parking demands.

Zone 012 - North Station and its surrounding area.

Zone 017 - Lower end of Washington Street and the Market area west of the Central Artery.

Zone 029 - John Hancock Building, etc.

Zone 038 - Boston City Hospital.

Zones 045-052 - Generally the Washington Street and Tremont Street shopping and business areas, Post Office Square and South Station.

Although these twelve zones might have been selected as the only zones to be studied in Boston Proper, all forty-two downtown zones were combined for analysis purposes.

1963 ESTIMATED PARKING SPACE DEMAND

The auto peak accumulation method⁽¹⁾ was used to estimate 1963 parking space demand for the forty-two zones in Boston Proper. The peak accumulations were calculated from the 'in' and 'out' auto driver trips for each of the forty-two zones. The combined zonal accumulation or 1963 zonal demand is shown in Table A-1.

The highest auto accumulation for work trips generally occurred between 9:00 AM and 1:00 PM. The non-work peaks were not as consistent, with peaks occurring throughout the day; however, two significant periods did occur at 10:00 AM to 12:00 noon and 6:00 PM to 8:00 PM. Zone 029 had the largest work trip parking demand accumulation of 3590 spaces at 2:00 PM. The occurrence of the afternoon peak is probably due to the sales personnel visits or trips to their home offices which may or may not be considered as work trips. The largest park-

(1) For details on Methodology, see Chapter III.



BOSTON PROPER

Study Zones - All Zones

TABLE A-1

BOSTON PROPER
ZONAL COMBINED HOURLY ACCUMULATION

Zone	012	013	014	015	016	017	018	019	020	021	022	023	024	025	026
Time															
0000	-	-	37	-	-	107	-	-	175	-	97	-	92	175	105
0100	46	-	-	-	-	68	-	-	-	-	-	-	-	-	-
0200	30	-	-	-	-	-	-	-	-	-	-	-	-	-	40
0300	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0400	665	40	-	-	-	17	-	-	-	-	-	71	-	-	-
0500	109	87	44	126	38	34	-	-	-	37	-	-	-	-	-
0600	198	128	172	189	125	214	57	-	-	-	-	156	-	-	-
0700	535	244	323	567	103	442	149	141	489	130	269	252	174	343	241
0800	1618	370	609	649	234	1056	265	175	1010	167	278	969	191	449	521
0900	1960	330	662	678*	402	1210	299	208	1367	272	430	230	308*	603	1076
1000	1944	354	689*	638	423	1436	-	208	1390	249	452	1938	291	700*	1089*
1100	2119*	387	636	599	475*	1520*	-	-	1470*	-	564	2038*	217	636	908
1200	1886	-	583	-	415	1508	337*	192	1380	216	183	1905	-	673	812
1300	1856	402*	605	-	331	1484	-	228	1319	302*	420	1990	275	539	896
1400	1690	385	555	597	292	1261	-	247	1349	264	630*	1935	208	622	839
1500	1516	298	563	555	261	1084	299	73	1182	301	359	1589	156	431	783
1600	1252	139	480	425	135	725	170	286*	801	213	249	1001	75	297	592
1700	246	79	323	299	19	465	74	80	477	180	268	228	71	262	319
1800	390	-	397	209	184	464	77	206	327	87	427	212	92	303	283
1900	711	-	426	821	99	446	-	-	418	86	467	170	-	202	284
2000	904	-	235	75	56	517	-	166	193	-	326	71	101	98	205
2100	958	-	189	35	-	471	-	126	117	98	330	-	46	338	195
2200	474	-	69	75	40	326	-	-	-	17	228	66	-	-	119
2300	175	-	21	-	-	283	-	76	25	-	198	-	-	-	160

*Highest Hourly Accumulation

TABLE A-1

BOSTON PROPER
ZONAL COMBINED HOURLY ACCUMULATION

Zone	027	028	029	030	031	032	033	034	035	036	037	038	039	040	041
Time															
0000	-	192	80	106	91	-	-	-	9	-	58	-	-	-	-
0100	39	-	-	-	-	40	-	-	-	-	-	-	-	-	-
0200	-	201	-	-	46	40	-	-	-	-	-	-	-	-	-
0300	55	-	107	-	-	40	-	-	-	40	-	-	-	-	-
0400	-	-	-	-	-	77	-	-	-	-	-	-	-	-	-
0500	117	-	179	58	-	178	-	-	-	-	140	109	-	112	45
0600	167	-	459	121	145	140	-	242	47	78	172	200	209	473	-
0700	305	292	1104	262	157	376	17	620	298	193	337	561	548	519*	100
0800	519	538	2990	608	324	495	130	746	523	257	404*	1179	768	519*	-
0900	699	711	3414	828	435	402	285	-	541	250	403	1722	-	435	219
1000	673	990	3550	998	417	605	327	767*	608	279	367	1666	813*	-	-
1100	700	994*	3711	1068	438*	723*	364*	701	608	275	404*	1796*	768	-	321*
1200	816	842	4175*	1109*	375	723*	227	662	625	292	293	1757	-	-	284
1300	727	718	3917	1008	336	576	331	-	640*	44	375	1733	687	514	309
1400	826*	700	3768	883	338	556	129	-	609	308	353	1740	753	512	197
1500	748	617	3387	793	318	489	112	647	552	385*	255	1538	671	423	266
1600	659	369	2070	618	323	193	79	234	267	273	218	793	349	135	202
1700	341	265	1006	304	15	195	62	11	128	155	138	542	78	135	156
1800	602	322	1056	370	14	285	55	-	-	145	45	344	36	74	39
1900	620	298	1008	453	60	303	52	-	186	-	84	156	-	192	137
2000	311	611	835	632	176	276	10	-	126	73	-	151	17	173	85
2100	288	404	684	460	116	190	-	-	-	203	-	149	36	-	-
2200	160	156	502	246	22	152	-	-	-	112	56	33	-	-	-
2300	157	104	451	97	-	118	-	-	40	75	15	-	-	69	-

*Highest Hourly Accumulation

TABLE A-1

BOSTON PROPER
ZONAL COMBINED HOURLY ACCUMULATION

Zone	042	043	044	045	046	047	048	049	050	051	052	053	TOTAL
0000	-	-	17	317	167	-	51	40	-	46	-	150	2147
0100	-	-	-	54	84	-	-	-	-	2	-	-	497
0200	-	-	-	-	-	-	51	-	233	39	-	-	680
0300	-	35	-	-	-	-	-	-	260	-	-	-	536
0400	-	-	-	314	-	-	-	45	236	27	-	-	894
0500	-	49	-	330	169	-	-	61	253	27	-	-	2302
0600	83	102	229	368	-	-	112	144	269	218	56	365	5640
0700	123	586	517	602	495	202	320	491	602	1049	643	468	16182
0800	-	770	934	1368	844	853	1047	1777	1503	1903	2118	802	32479
0900	177*	906	1109	1549	1011*	1862	1657	2343	2043	2287	2758	773	38851
1000	-	762	828	2003	920	2473	2064	2483	2079	2472	2972	882*	43801
1100	-	877	1076	2018	920	2508	1968	2509	2159*	2557	3004	812	44845
1200	52	242	1146	2023*	77	2556*	2072*	2650	1920	2611	3275*	794	41774
1300	52	906*	1192*	1896	-	2378	1918	2656	2012	2671	3172	738	42149
1400	-	901	1148	1909	15	2160	1877	2679*	2033	2676	3120	738	41800
1500	91	784	1044	1607	714	1934	1846	2496	1941	2858*	2987	738	39687
1600	75	479	629	1329	679	1507	1342	2094	1452	1921	1826	505	27456
1700	-	234	430	811	347	1105	393	719	465	757	651	198	12830
1800	-	162	265	655	315	982	222	336	368	535	642	117	11643
1900	-	178	261	1024	326	1041	335	428	-	329	507	175	12282
2000	-	228	271	1758	201	1018	277	332	205	322	515	79	11628
2100	-	191	264	1835	-	599	123	275	228	312	398	-	9638
2200	-	191	201	1443	142	396	90	221	151	348	173	-	6208
2300	-	224	50	408	46	346	-	65	-	96	207	-	3507

*Highest Hourly Accumulation

ing demand for non-work trips was 1302 spaces at 9:00 PM in Zone 045.

The zonal accumulation or 1963 estimated parking space demand for almost all zones occurred from 9:00 AM to 1:00 PM. Zone 029 had the largest zonal peak of 4175 spaces at 12 noon. The total zonal accumulation for all forty-two zones or the 1963 estimated parking space demand in Boston Proper was 49,096.

1963 PARKING TYPE USAGE

The total twenty-four hour parking space usage for the forty-two study zones in Boston Proper was 117,352 (See Table A-2). Of this total on-street parking constituted 44%, off-street 45% and garage space 10.7%.

Comparing the usage in the forty-two zones, on-street parking as a percentage of the total zone parking varied from a high of 81.5% to a low of 6.8% while the off-street parking ranged from a high of 93.2% to a low of 4.4%.

The most significant element is the 10.7% usage for garage parking in the Boston Proper area. This area has the largest garage usage of any of the study areas.

Garage parking in several zones in Boston was considerable. Zones 046 and 047 indicated the largest usage with 28.5% and 28.4% respectively.

The analysis of the hourly parking usage by type for the

TABLE A-2

BOSTON PROPER
1963 24 HOUR PARKING USAGE BY TYPE

ZONE	NUMBER BY TYPE									TOTAL
	Street			Lot			Garage			
	Free	Paid	Total	Free	Paid	Total	Free	Paid	Total	
012	1623	639	2262	1906	1424	3330	157	55	212	5804
%	28.0	11.0	39.0	32.8	24.6	57.4	2.7	.9	3.6	
013	53	-	53	723	-	723	-	-	-	776
%	6.8	-	6.8	93.2	-	93.2	-	-	-	
014	2055	122	2177	855	71	926	123	172	295	3398
%	60.5	3.6	64.1	25.2	2.1	27.3	3.6	5.1	8.7	
015	705	36	741	720	16	736	-	-	-	1477
%	47.8	2.4	50.2	48.7	1.1	49.8	-	-	-	
016	606	160	766	206	196	402	-	72	72	1240
%	48.9	12.9	61.8	16.6	15.8	32.4	-	5.8	5.8	
017	2066	274	2340	924	471	1395	-	186	186	3921
%	52.7	7.0	59.7	23.6	12.0	35.6	-	4.7	4.7	
018	187	-	187	261	38	299	-	-	-	486
%	38.5	-	38.5	53.7	7.8	61.5	-	-	-	
019	204	-	204	285	99	384	-	83	83	671
%	30.4	-	30.4	42.5	14.7	57.2	-	12.4	12.4	
020	427	31	458	1797	1332	3129	-	89	89	3676
%	11.6	.9	12.5	48.9	36.2	85.1	-	2.4	2.4	
021	1187	16	1203	54	16	70	147	150	297	1570
%	75.6	1.0	76.6	3.4	1.0	4.4	9.4	9.6	19.0	
022	1601	137	1738	512	202	714	118	119	237	2689
%	59.5	5.1	64.6	19.1	7.5	26.6	4.4	4.4	8.8	
023	597	145	742	1087	824	1911	54	247	301	2954
%	20.2	4.9	25.1	36.8	27.9	64.7	1.8	8.4	10.2	

TABLE A-2

BOSTON PROPER
1963 24 HOUR PARKING USAGE BY TYPE

ZONE	NUMBER BY TYPE									TOTAL
	Street			Lot			Garage			
	Free	Paid	Total	Free	Paid	Total	Free	Paid	Total	
024	162	17	179	118	97	215	39	572	611	1005
%	16.1	1.7	17.8	11.7	9.7	21.4	3.9	56.9	60.8	
025	1920	611	2531	451	215	666	-	38	38	3235
%	59.3	18.9	78.2	13.9	6.7	20.6	-	1.2	1.2	
026	1355	599	1954	424	251	675	-	89	89	2718
%	49.9	22.0	71.9	15.6	9.2	24.8	-	3.3	3.3	
027	1610	385	1995	493	239	732	-	39	39	2766
%	58.2	13.9	72.1	17.8	8.7	26.5	-	1.4	1.4	
028	1799	729	2528	448	470	918	41	217	258	3704
%	48.5	19.7	68.2	12.1	12.7	24.8	1.1	5.9	7.0	
029	2801	738	3539	1622	1898	3520	90	1008	1098	8157
%	34.3	9.0	43.3	19.9	23.3	43.2	1.1	12.4	13.5	
030	826	291	1117	812	683	1495	223	444	667	3279
%	25.2	8.9	34.1	24.8	20.8	45.6	6.8	13.5	20.3	
031	616	77	693	364	250	614	-	-	-	1307
%	47.1	5.9	53.0	27.9	19.1	47.0	-	-	-	
032	1610	16	1626	427	52	479	-	83	83	2188
%	73.6	.7	74.3	19.5	2.4	21.9	-	3.8	3.8	
033	656	-	656	204	94	298	-	-	-	954
%	68.8	-	68.8	21.4	9.8	31.2	-	-	-	
034	221	-	221	438	208	646	-	-	-	867
%	25.5	-	25.5	50.5	24.0	74.5	-	-	-	
035	801	59	860	377	258	635	-	35	35	1530
%	52.4	3.8	56.2	24.6	16.9	41.5	-	2.3	2.3	

TABLE A-2

BOSTON PROPER
1963 24 HOUR PARKING USAGE BY TYPE

ZONE	NUMBER BY TYPE									TOTAL
	Street			Lot			Garage			
	Free	Paid	Total	Free	Paid	Total	Free	Paid	Total	
036	837	91	928	150	-	150	-	61	61	1139
%	73.5	8.0	81.5	13.2	-	13.2	-	5.3	5.3	
037	1120	42	1162	373	-	373	-	-	-	1535
%	73.0	2.7	75.7	24.3	-	24.3	-	-	-	
038	1520	117	1637	2308	113	2421	16	-	16	4074
%	37.3	2.9	40.2	56.6	2.8	59.4	.4	-	.4	
039	302	44	346	838	33	871	39	-	39	1256
%	24.0	3.5	27.5	66.8	2.6	69.4	3.1	-	3.1	
040	480	-	480	903	213	1116	-	-	-	1596
%	30.1	-	30.1	56.6	13.3	88.9	-	-	-	
041	575	-	575	421	-	421	-	-	-	996
%	57.7	-	57.7	42.3	-	42.3	-	-	-	
042	269	-	269	119	-	119	-	-	-	388
%	69.3	-	69.3	30.7	-	30.7	-	-	-	
043	363	-	363	1593	96	1689	49	16	65	2117
%	17.1	-	17.1	75.2	4.5	79.8	2.3	.8	3.1	
044	636	46	682	657	832	1489	42	36	78	2249
%	28.3	2.0	30.3	29.2	37.0	66.2	1.9	1.6	3.5	
045	2043	210	2253	1017	1980	2997	66	1082	1148	6398
%	31.9	3.3	35.2	15.9	30.9	46.8	1.0	17.0	18.0	
046	568	130	698	294	294	588	84	428	512	1798
%	31.6	7.2	38.8	16.4	16.4	32.8	4.6	23.8	28.4	
047	2230	719	2949	979	1701	2680	44	2186	2230	7859
%	28.4	9.1	37.5	12.5	21.6	34.1	.6	27.8	28.4	

TABLE A-2

BOSTON PROPER
1963 24 HOUR PARKING USAGE BY TYPE

ZONE	NUMBER BY TYPE									TOTAL
	Street			Lot			Garage			
	Free	Paid	Total	Free	Paid	Total	Free	Paid	Total	
048	1311	289	1600	850	1117	1967	62	738	800	4367
%	30.0	6.6	36.6	19.4	25.6	45.1	1.4	16.9	18.3	
049	786	444	1230	679	1285	1964	90	1082	1172	4366
%	18.0	10.2	28.2	15.6	29.4	45.0	2.0	24.8	26.8	
050	987	374	1361	910	798	1708	17	583	600	3669
%	26.9	10.2	37.1	24.8	21.7	46.5	.5	15.9	16.4	
051	2287	291	2578	2338	1232	3570	126	176	302	6450
%	35.5	4.5	40.0	36.2	19.1	55.3	2.0	2.7	4.7	
052	963	389	1352	878	1916	2794	50	842	892	5038
%	19.1	7.7	26.8	17.4	38.0	55.4	1.1	16.7	17.8	
053	372	136	508	699	479	1178	-	-	-	1686
%	22.0	8.1	30.1	41.5	28.4	69.9	-	-	-	
Tot.	43339		51741		21494		1677		12605	
		8402			31512			10928		117352
			44.1			45.2			10.7	

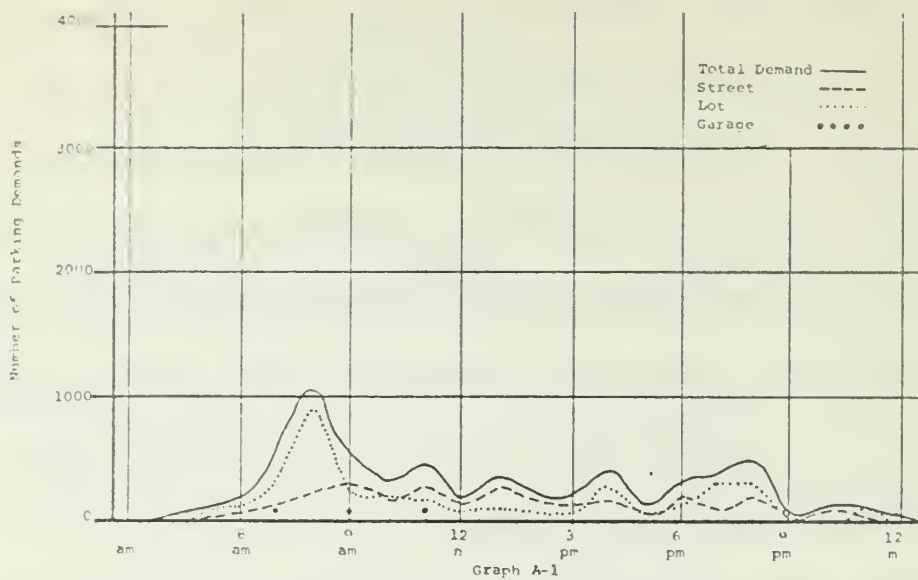
forty-two zones revealed that the hourly peaks or greatest parking activities occurred at 8:00 AM or 9:00 AM. Following the morning peak the hourly usage generally declined without any other significant peaks except in a few zones which had significant evening entertainment activities, such as Zone 045. Graphs A-1 through A-12 generally represent the hourly usage trends for the Boston Proper sector.

PURPOSE OF TRIPS THAT PARKED

The study of trips by purpose to the forty-two zones revealed that there were for the combined total, 70,538 work vs. 36,307 non-work trips. The plotting of the 'ins' for the twelve most active zones as shown on Graphs A-13 through A-24 indicated all zones having work trip peaks at 8:00 AM, then generally declining with the exception of some secondary peaks. Non-work trips in most zones did not have individually high peaks except for two of the most active zones (045 and 047) which had peaks at 8:00 PM and 10:00 AM, respectively.

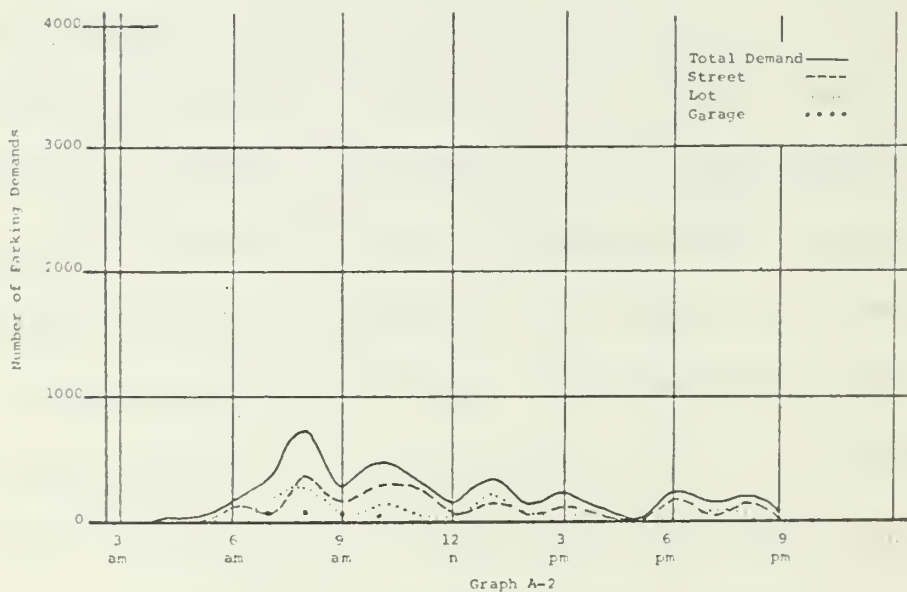
Trip characteristics were further tabulated in eight categories by trip purpose (Table A-3). Work trips represented 51.7% of all trips made in the forty-two zones. The combined non-work trips amounted to 26.7% while 'other' trips represented 21.6%.

Within the zones the work trips varied from a zonal high of 92.5% to a low of 21.8%. The non-work trips varied



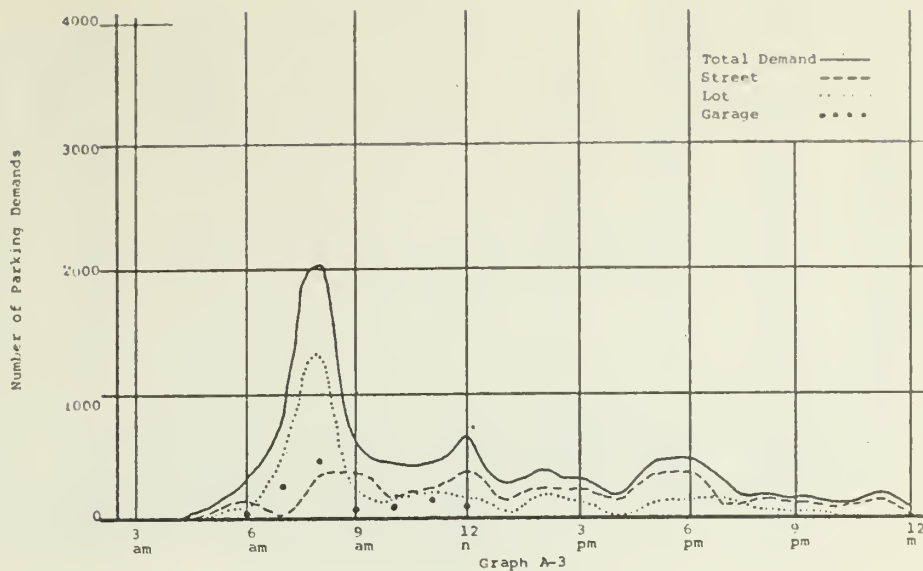
BOSTON PROPER (012)

1963 HOURLY PARKING DEMAND BY PARKING TYPE



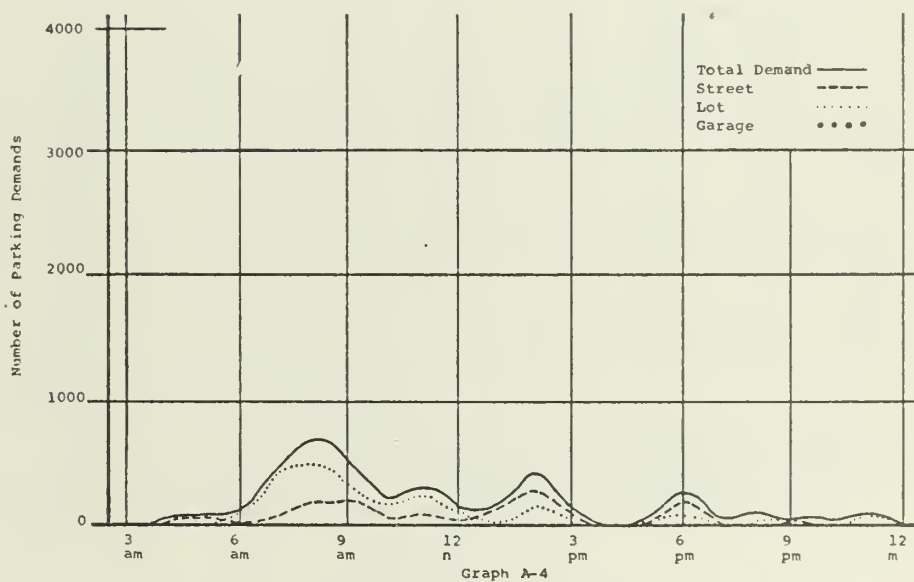
BOSTON PROPER (017)

1963 HOURLY PARKING DEMAND BY PARKING TYPE



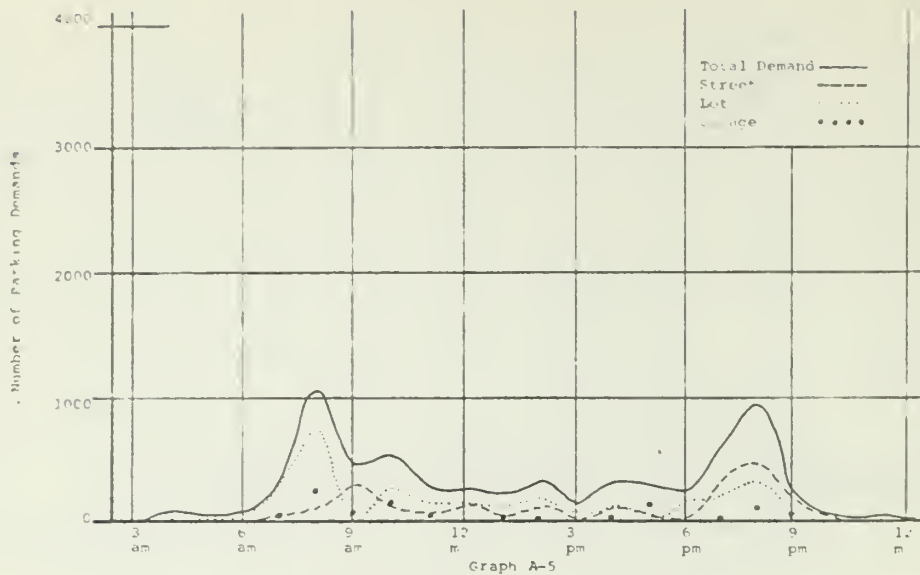
BOSTON PROPER (029)

1963 HOURLY PARKING DEMAND BY PARKING TYPE

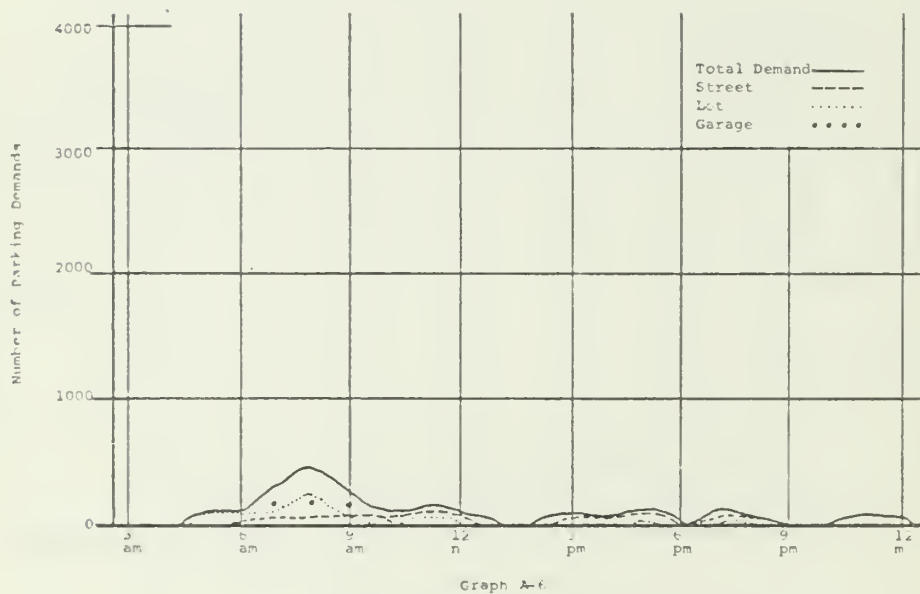


BOSTON PROPER (038)

1963 HOURLY PARKING DEMAND BY PARKING TYPE



BOSTON PROPER (045)
1963 HOURLY PARKING DEMAND BY PARKING TYPE



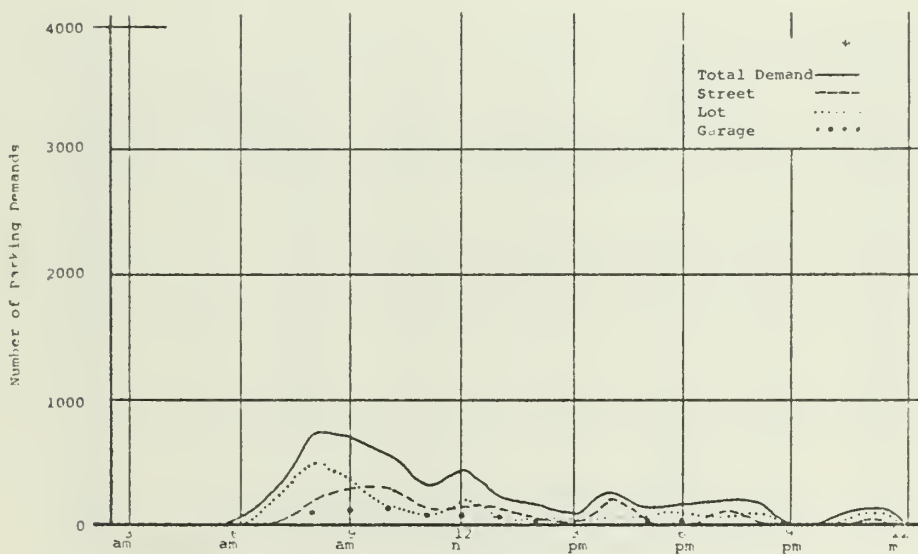
BOSTON PROPER (046)
1963 HOURLY PARKING DEMAND BY PARKING TYPE



Graph A-7

BOSTON PROPER (047)

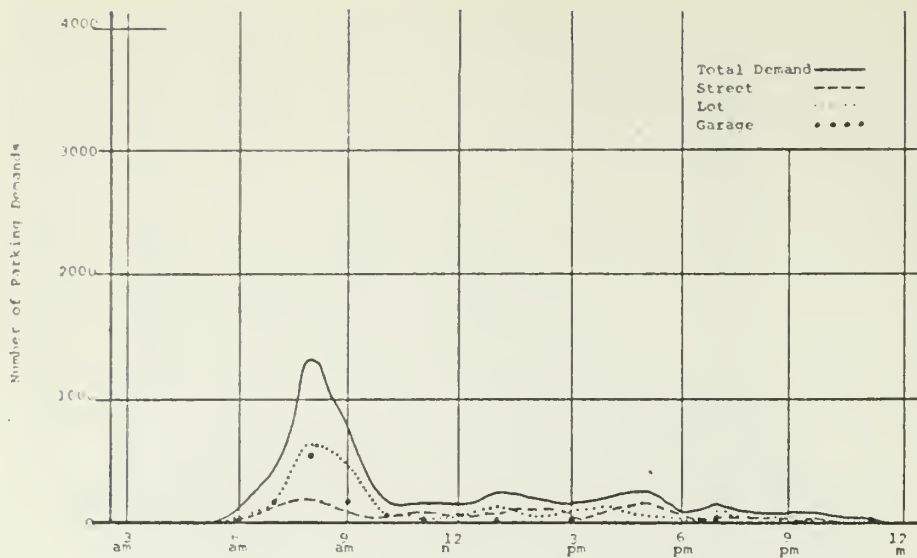
1963 HOURLY PARKING DEMAND BY PARKING TYPE



Graph A-8

BOSTON PROPER (048)

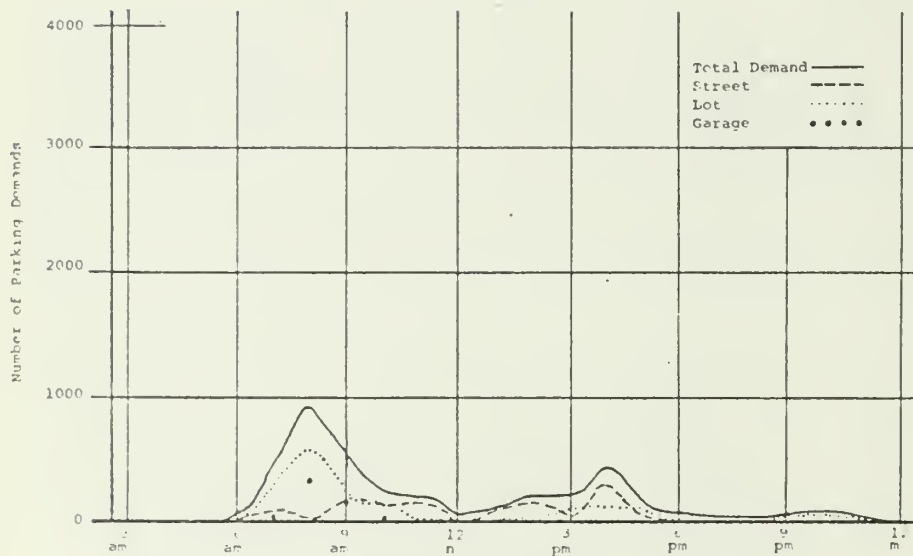
1963 HOURLY PARKING DEMAND BY PARKING TYPE



Graph A-9

BOSTON PROPER (049)

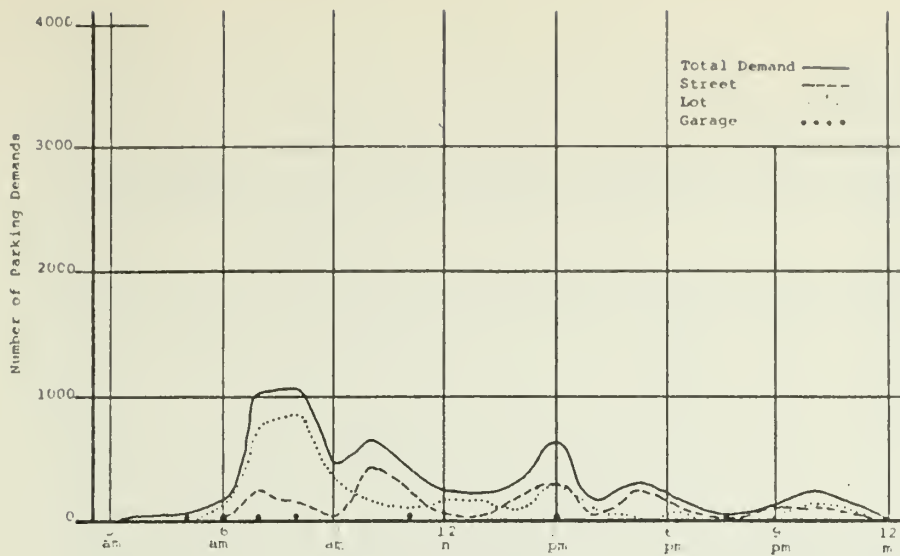
1963 HOURLY PARKING DEMAND BY PARKING TYPE



Graph A-10

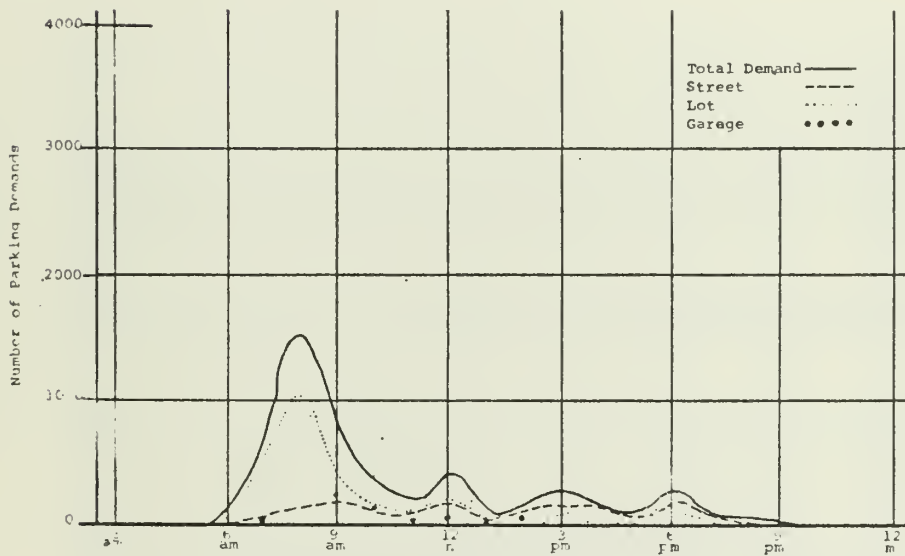
BOSTON PROPER (C.)

1963 HOURLY PARKING DEMAND BY PARKING TYPE



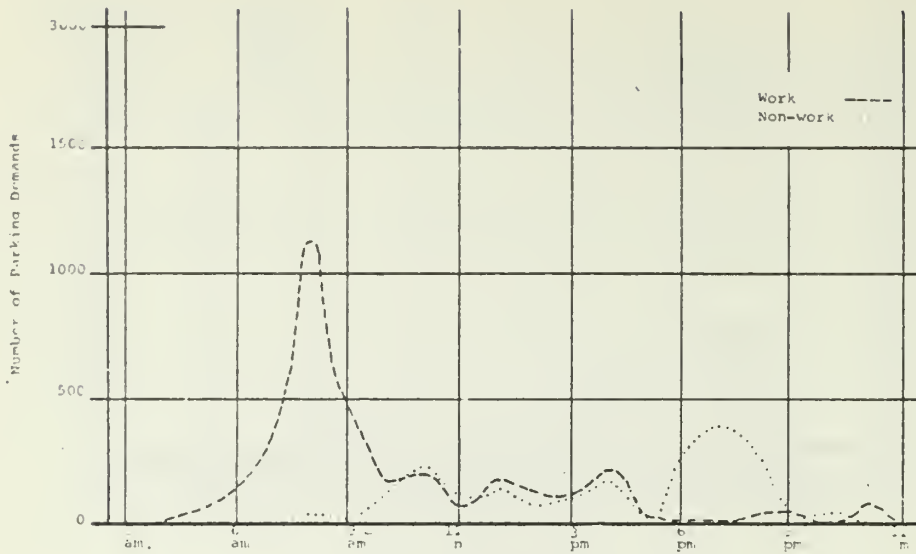
BOSTON PROPER (051)

1963 HOURLY PARKING DEMAND BY PARKING TYPE



BOSTON PROPER (052)

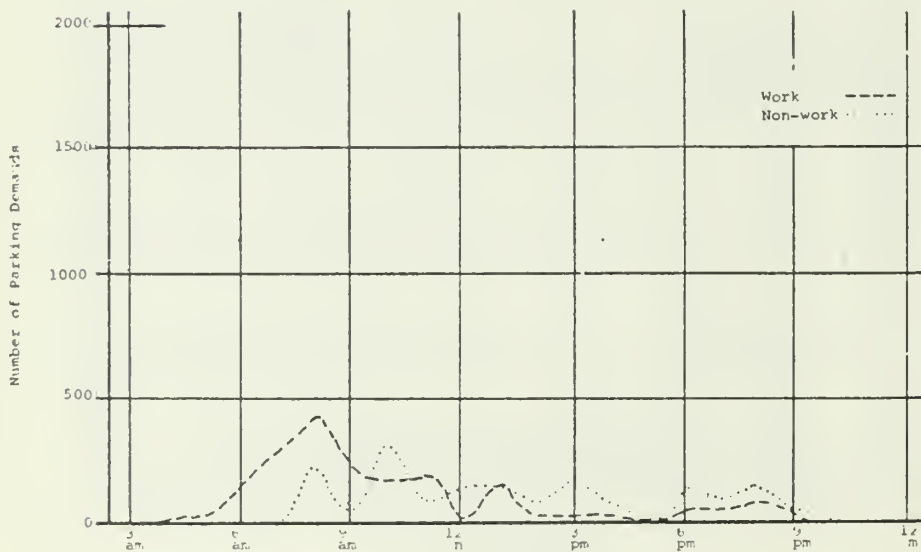
1963 HOURLY PARKING DEMAND BY PARKING TYPE



Graph A-13

BOSTON PROPER (012)

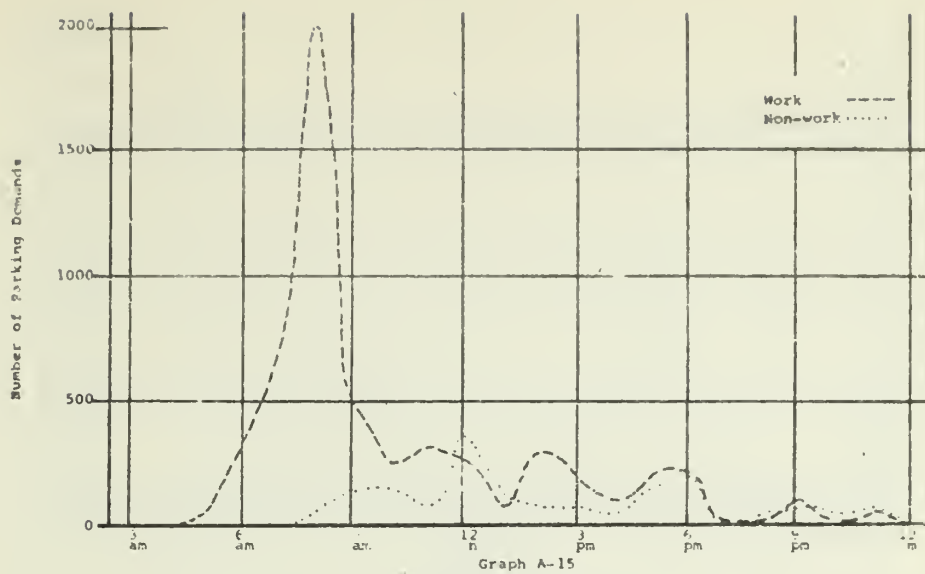
1963 HOURLY PARKING DEMAND BY PURPOSE



Graph A-14

BOSTON PROPER (017)

1963 HOURLY PARKING DEMAND BY PURPOSE



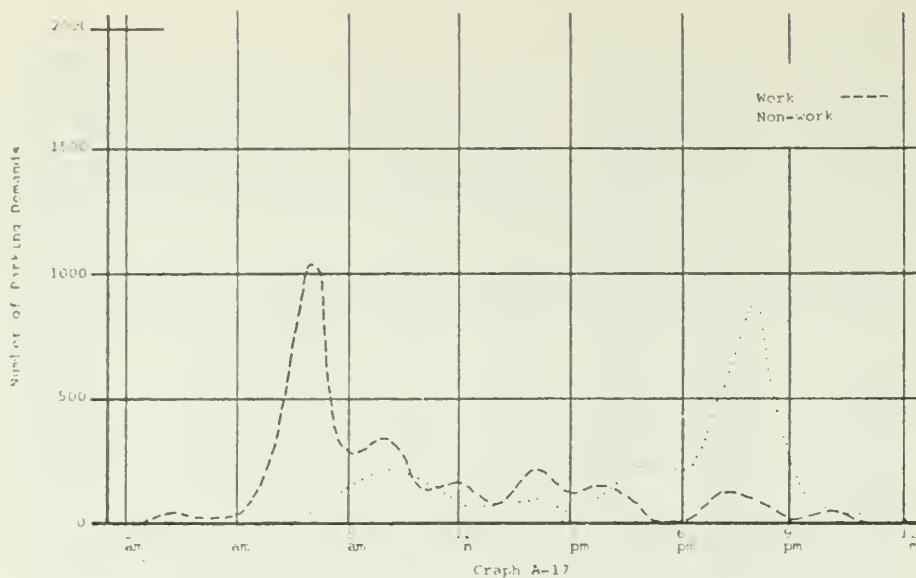
BOSTON PROPER (029)

1963 HOURLY PARKING DEMAND BY PURPOSE

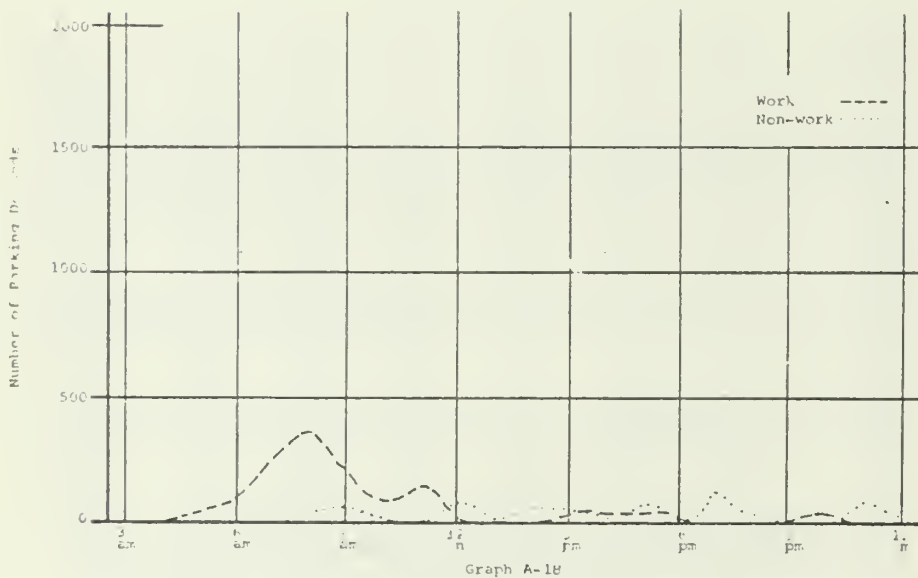


BOSTON PROPER (038)

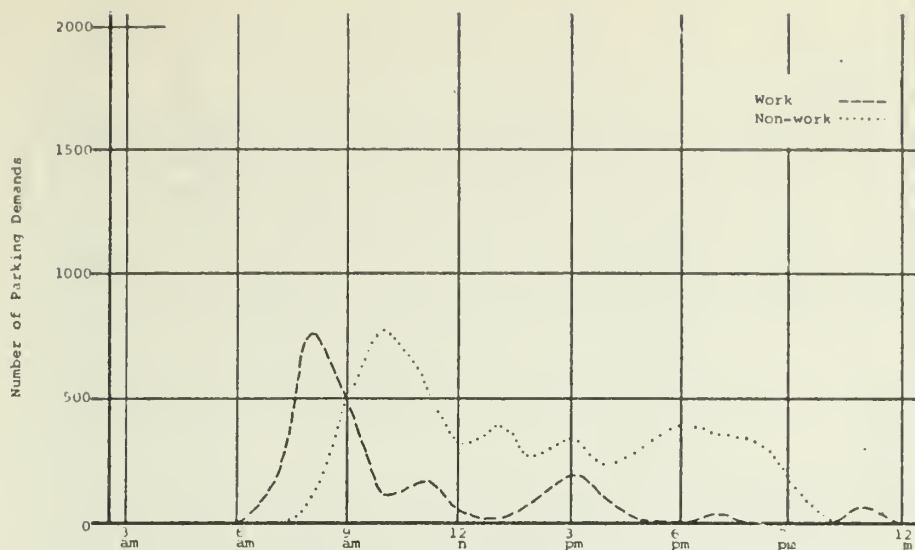
1963 HOURLY PARKING DEMAND BY PURPOSE



BOSTON PROPER (045)
1963 HOURLY PARKING DEMAND BY PURPOSE



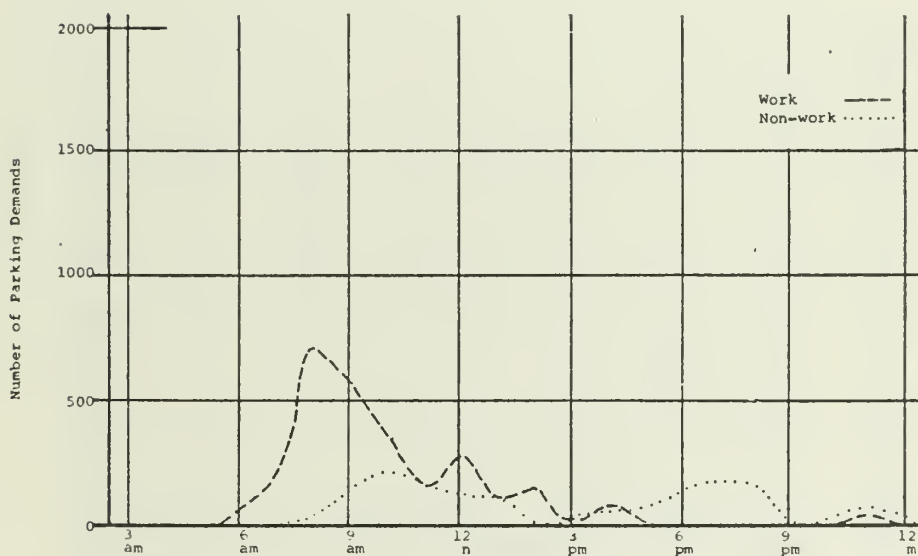
BOSTON PROPER (046)
1963 HOURLY PARKING DEMAND BY PURPOSE



Graph A-19

BOSTON PROPER (047)

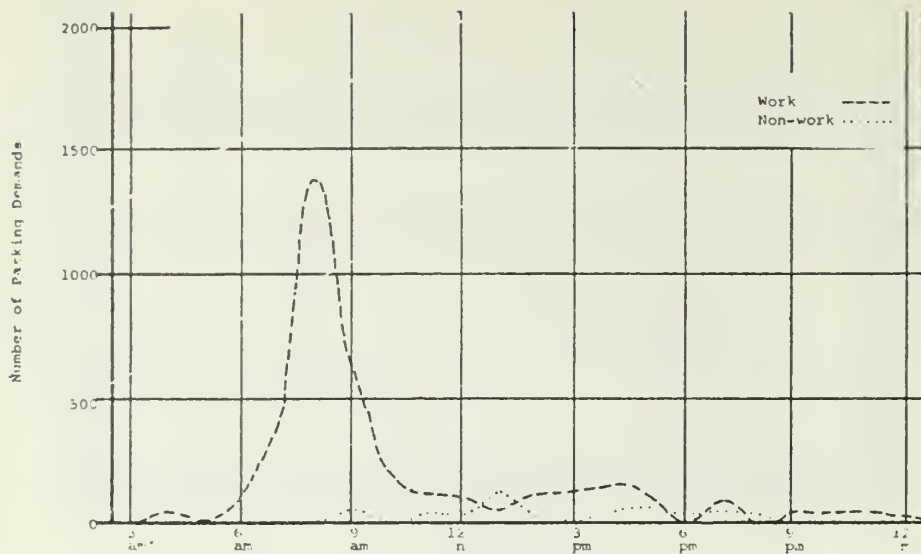
1963 HOURLY PARKING DEMAND BY PURPOSE



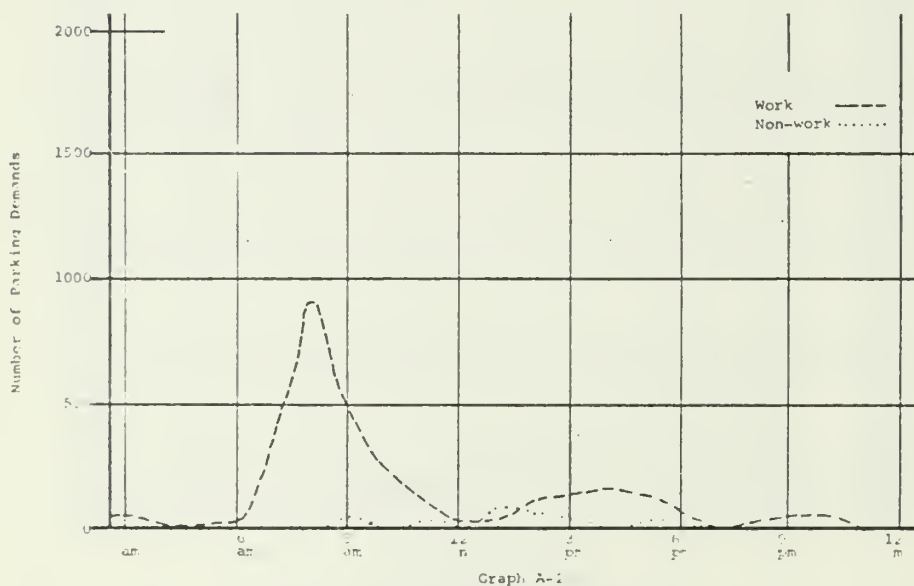
Graph A-20

BOSTON PROPER (048)

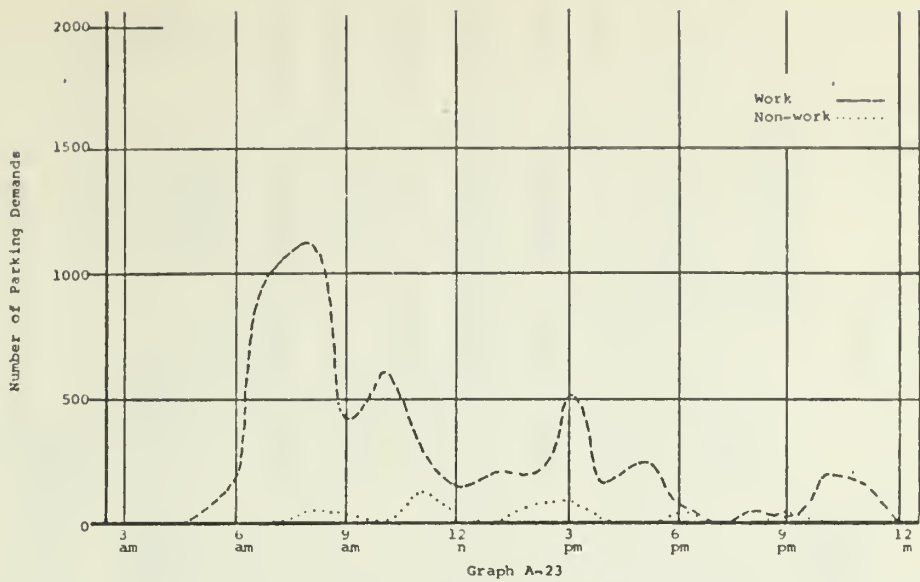
1963 HOURLY PARKING DEMAND BY PURPOSE



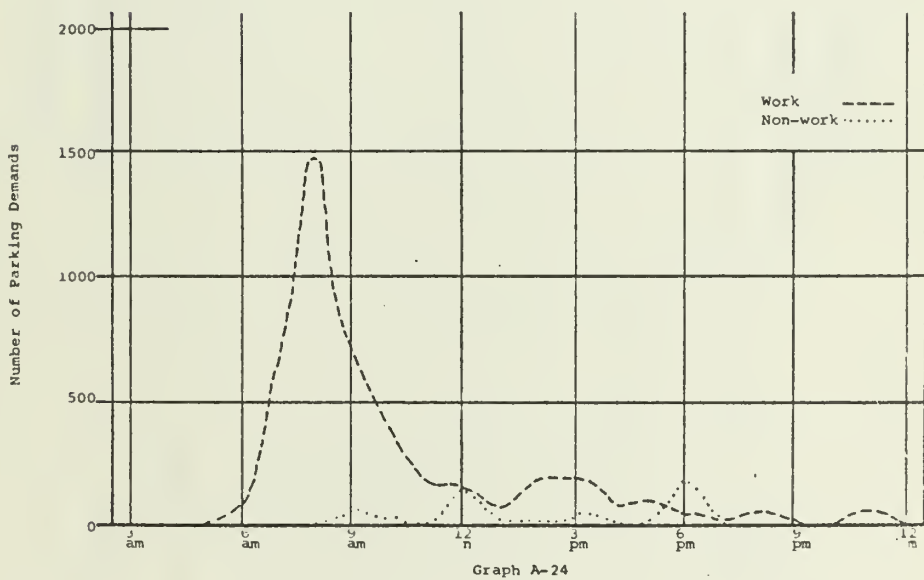
BOSTON PROPER (049)
1963 HOURLY PARKING DEMAND BY PURPOSE



BOSTON PROPER (050)
1963 HOURLY PARKING DEMAND BY PURPOSE



Graph A-23
BOSTON PROPER (051)
1963 HOURLY PARKING DEMAND BY PURPOSE



Graph A-24
BOSTON PROPER (052)
1963 HOURLY PARKING DEMAND BY PURPOSE

TABLE A-3

BOSTON PROPER

1963 TRIPS BY PURPOSE TO ZONES

WORK TRIPS				NON-WORK TRIPS								OTHER TRIPS							
ZONE	Work	%	Per Bus	Rec	%	Sch	%	Soc	%	Shop Conv	%	Shop GAF	%	Non-Work	%	Other	%	TOTAL	
	1		2	3		4		5		7		8				0-6-9			
012	3611	54.9	828	12.6	877	13.3	-	36	.5	132	2.0	216	3.3	2089	31.7	884	13.4	6584	
013	6150	79.3	40	5.1	-	-	-	-	-	-	-	-	-	40	5.1	1209	15.6	7754	
014	1195	27.6	624	14.4	46	1.2	-	218	5.0	161	3.7	62	1.4	1111	25.7	2019	46.7	4325	
015	1334	89.3	161	10.7	-	-	-	-	-	-	-	-	-	161	10.7	-	-	1495	
016	1047	73.2	230	16.1	-	-	-	-	-	38	2.6	-	-	268	18.7	115	8.1	1430	
017	1838	44.0	513	12.3	-	-	118	2.8	99	2.3	801	19.1	145	3.4	1676	40.1	659	15.7	4173
018	355	61.6	-	-	-	-	-	39	6.8	-	-	-	-	39	6.8	182	31.6	576	
019	324	46.8	47	6.8	-	-	-	193	28.0	-	-	17	2.5	257	37.3	110	15.9	691	
020	1910	46.7	578	14.1	183	4.5	52	1.3	492	12.0	-	-	-	1305	31.9	875	21.4	4090	
021	508	28.1	245	13.5	52	2.9	17	.9	141	7.8	-	-	-	455	25.1	848	46.8	1811	
022	721	21.8	364	11.0	121	3.6	109	3.3	441	13.3	186	5.6	-	1221	36.8	1371	41.4	3313	

TABLE A-3

BOSTON PROPER

1963 TRIPS BY PURPOSE TO ZONES

WORK TRIPS				NON-WORK TRIPS							OTHER TRIPS							
ZONE	Work	%	Per	Rec	%	Sch	%	Soc	%	Shop	%	Shop	%	Non-	%	Other	%	TOTAL
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
023	2188	70.8	231	7.5	-	165	5.3	159	5.2	-	-	-	-	555	18.0	345	11.2	3088
024	216	20.8	36	3.4	79	7.6	-	-	-	16	1.6	-	-	131	12.6	690	66.6	1037
025	810	19.3	308	7.3	170	4.1	290	6.9	149	3.6	-	-	-	917	21.9	2466	58.8	4193
026	962	25.3	555	14.6	17	.4	320	8.5	467	12.3	-	-	-	1359	35.8	1479	38.9	3800
027	1728	56.7	338	11.1	118	3.9	394	12.9	34	1.1	130	4.2	54	1068	35.0	253	8.3	3049
028	1245	29.1	1079	25.2	126	2.9	142	3.3	365	8.5	145	3.4	208	2065	48.2	974	22.7	4284
029	5689	59.7	890	9.3	223	2.3	-	-	148	1.5	36	.3	643	1940	20.3	1891	19.8	9520
030	1761	44.0	477	11.9	37	.9	47	1.1	450	11.2	16	.4	143	1170	29.2	1064	26.6	3995
031	705	43.1	345	21.2	89	5.4	-	-	39	2.4	34	2.1	119	626	38.4	302	18.5	1633
032	1354	55.1	200	8.2	-	-	266	10.8	89	3.6	39	1.6	-	594	24.2	510	20.7	2458
033	538	54.5	125	12.6	37	3.7	159	16.1	-	-	38	3.9	-	359	36.3	91	9.2	988

TABLE A-3

BOSTON PROPER

1963 TRIPS BY PURPOSE TO ZONES

WORK TRIPS				NON-WORK TRIPS							OTHER TRIPS							
ZONE	Work.	%	Per Bus	Rec	%	Sch	%	Soc	%	Shop Conv	%	Shop GAF	%	Non-Work	%	Other	%	TOTAL
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
034	802	92.5	49	5.7	-	16	1.8	-	-	-	-	-	-	65	7.5	-	-	867
035	1019	51.2	245	12.3	105	5.3	40	2.0	54	2.7	-	-	-	444	22.3	529	26.5	1992
036	663	44.5	95	6.4	39	2.6	-	-	195	13.0	55	3.7	-	384	25.7	444	29.8	1491
037	975	55.4	171	9.7	138	7.9	-	-	58	3.3	-	45	2.5	412	23.4	373	21.2	1760
038	2889	61.4	334	7.0	-	76	1.6	394	8.3	41	.8	16	.3	861	18.3	949	20.1	4699
039	1007	73.4	-	-	-	-	-	79	5.7	-	-	-	-	79	5.7	287	20.9	1373
040	887	51.6	44	2.6	38	2.2	16	.9	17	1.0	-	87	5.1	202	11.8	630	36.6	1719
041	412	30.0	231	16.8	35	2.6	17	1.3	47	3.4	200	14.6	-	530	38.7	430	31.3	1372
042	199	38.3	127	24.4	-	-	-	-	62	11.9	-	-	-	189	36.3	132	25.4	520
043	1925	83.6	98	4.2	-	-	-	-	-	-	-	39	1.7	137	5.9	242	10.5	2304
044	1063	42.1	184	7.3	82	3.2	345	13.7	164	6.5	163	6.4	-	938	37.1	524	20.8	2525

TABLE A-3

BOSTON PROPER

1963 TRIPS BY PURPOSE TO ZONES

WORK TRIPS				NON-WORK TRIPS							OTHER TRIPS				
ZONE	Work	%	Per Bus	Rec	%	Sch	%	Soc	%	Shop Conv	%	Shop GAF	Non-work	Other	TOTAL
	1		2	3		4		5		7		8		0-6-9	
045	3212	44.5	937	13.0	1542	21.4	16	.2	363	5.0	170	2.3	130	1.8	3158 43.9 820 11.4 7190
046	1250	62.3	420	20.9	37	1.8	-	-	93	4.6	-	-	71	3.5	621 31.0 134 6.6 2005
047	2231	24.2	395	4.2	331	3.6	-	-	-	462	5.0	3994	43.3	5182 56.2 1795 19.5 9208	
048	2805	57.5	799	16.4	273	5.5	-	-	307	6.2	45	.9	132	2.7	1556 31.9 510 10.4 4871
049	3787	76.0	420	8.4	42	.8	-	-	54	1.0	-	-	-	516 10.3 677 13.5 4980	
050	3124	71.7	223	5.1	-	-	-	-	46	1.0	16	.3	72	1.6	357 8.2 873 20.0 4354
051	5828	74.0	535	6.7	-	-	-	-	44	.5	17	.2	-	-	596 7.5 1446 18.3 7870
052	4268	71.2	260	4.3	-	-	215	3.5	16	.2	-	-	35	.5	526 8.7 1195 19.9 5989
053	1535	80.9	96	5.1	17	.9	-	-	-	-	-	-	38	2.0	151 8.0 211 11.1 1897
Tot.	70538		13875		4856		2821		5548		2941		6266		29454 136299
%	51.7		10.2		3.6		2.1		4.1		2.1		4.6		26.7 21.6

from a high of 56.2% to a low of 5.1%. The zonal high for 'other' trips was 66.6%; however, the average for all zones was only 21.6%. Personal business was generally the most active trip purpose category; however, in Zone 017 the shopping convenience category amounted to 19.1% and in Zone 047 shopping GAF represented 43.3% of the zone's total trips.

Therefore, of all the 1963 auto driver trips entering the Boston Proper area, 78.4% of them required some form of parking. The remaining 21.6% were not considered in this study.

1990 ESTIMATED PARKING SPACE DEMAND

The 1990 estimated parking space demand was calculated for both 1990 Transportation Plans A and C. The space estimating factor technique⁽¹⁾ was employed to make these determinations.

Since the Boston Proper study area consists of forty-two zones, it was necessary to calculate an estimating factor value for each zone. (See Table A-4). These factor values were then used to derive the 1990 estimated parking space demands for the study area.

The estimated demand for the two 1990 plans for Boston Proper indicates increases of about 125%. This projected increase when compared to the 1966 supply of 47,902⁽²⁾ parking

(1) See Chapter III for details of methodology

(2) BRA Parking Inventory Report

TABLE A-4

1990 ESTIMATED PARKING SPACE DEMAND
BOSTON PROPER

ZONE	COMBINED FACTOR VALUE	ESTIMATED DEMAND		
		1963	1990A	1990C
012	.322	2119	2912	2770
013	.518	402	487	469.
014	.159	689	1076	1046
015	.453	678	2042	1816
016	.332	474	1584	1372
017	.364	1520	1726	1530
018	.585	337	0	6
019	.414	286	311	261
020	.359	1470	1239	1149
021	.167	301	1331	1068
022	.190	629	2788	2158
023	.659	2038	6266	4419
024	.296	307	102	93
025	.166	700	1707	1499
026	.286	1088	2910	2536
027	.270	825	1757	1587
028	.231	993	1386	1300
029	.438	4174	16260	15969
030	.277	1109	1360	1315
031	.267	437	768	672
032	.293	722	1886	1578

TABLE A-4

1990 ESTIMATED PARKING SPACE DEMAND
BOSTON PROPER

ZONE	COMBINED FACTOR VALUE	ESTIMATED DEMAND		
		1963	1990A	1990C
033	.368	364	398	385
034	.884	767	2035	1340
035	.321	640	1084	1115
036	.258	385	1555	1565
037	.229	404	1284	1323
038	.382	1795	2576	2714
039	.592	813	1606	1667
040	.302	519	599	579
041	.234	321	951	940
042	.340	177	723	564
043	.393	906	679	672
044	.472	1192	1463	1406
045	.276	2022	2558	2276
046	.504	1011	2155	2074
047	.277	2556	4546	4137
048	.429	2071	7148	6346
049	.537	2679	11670	11470
050	.495	2158	7119	6895
051	.363	2857	4096	3998
052	.546	3275	13178	12746
053	.464	881	1766	1737
TOTAL		49091	119088	110562

spaces reveals deficiencies of over 60,000 if no increase of supply is made. The BRA report "Inventory of Existing (1968) and Estimate of Future (1990) Parking Supply" states that based on future plans the 1990 supply for the Boston Proper sector would be 65,645. This, compared to the estimates in this report, still indicated that large deficiencies will exist in 1990.

The estimated demand figures in this report are based on projected trip totals only, and did not consider other parking space restrictions such as available land area, parking regulations, and fees, etc. Therefore, the data developed by this report will serve as a warning that an even more serious parking problem might exist by 1990.

It is therefore recommended that the parking needs be constantly reviewed and that future studies be undertaken to prepare alternative plans for the provision of parking space outside the core area for those persons seeking a Boston Proper destination.

2. FENWAY-JAMAICA PLAIN

INTRODUCTION

The Fenway-Jamaica Plain sector, located to the west of the Boston Proper sector, represents the parking type and usage demanded by educational, cultural and entertainment activities located within a core city of a metropolitan region.

The four traffic zones selected from Fenway-Jamaica Plain (114, 115, 116, 117) attracted about 70% of all auto driver trips destined for the sector. The important activities in each are:

Zone 114 - Northeastern University and the
Boston Art Museum

Zone 115 - Harvard Medical School

Zone 116 - Fenway Park, which had the
smallest attraction strength

Zone 117 - Boston University and Kenmore Square

1963 HOURLY PARKING SPACE DEMAND

The auto accumulation method⁽¹⁾ was used to estimate 1963 parking space demand for the selected zones in Fenway-Jamaica Plain. The peak demands were calculated from the 'in' and 'out' driver trips as indicated by Graphs A-25 through A-28.

The greatest auto accumulation for work trips in all four zones occurred from 10:00 AM to 12 noon. The non-work trip peak varied: Zone 114 peaked at 7:00 PM, Zone 115 at 10:00 AM, Zone 116 at 8:00 PM and Zone 117 at 2:00 PM. The peak accumulation for combined work and non-work trips appeared at 10:00 AM in Zones 114 and 115, while the peaks occurred at 1:00 PM in Zone 116 and 2:00 PM in Zone 117.

The total 1963 estimated hourly parking space demand for each of the four zones was Zone 114 - 4219, Zone 115 - 6025, Zone 116 - 3144 and Zone 117 - 4397, or a combined study area total of 17,785.

1963 PARKING TYPE USAGE


The total 24 hour parking space usage for the combined zones in Fenway-Jamaica Plain was 49,019 (Table A-5). Of this total 38.9% constituted on-street parking, 59.0% was off-street and only 2.1% was garage space parking.

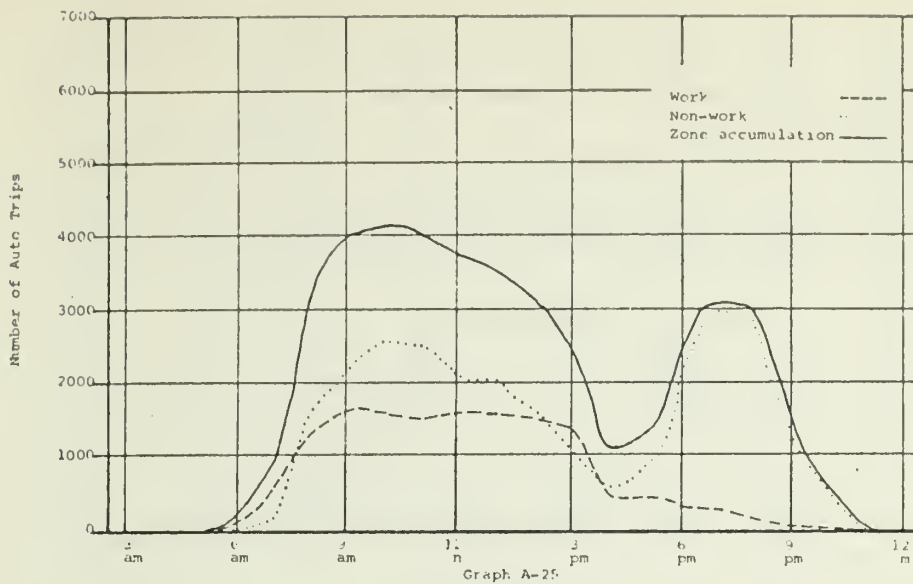
Comparing usage in the four zones, on-street usage ranged

(1) For details on Methodology, See Chapter III



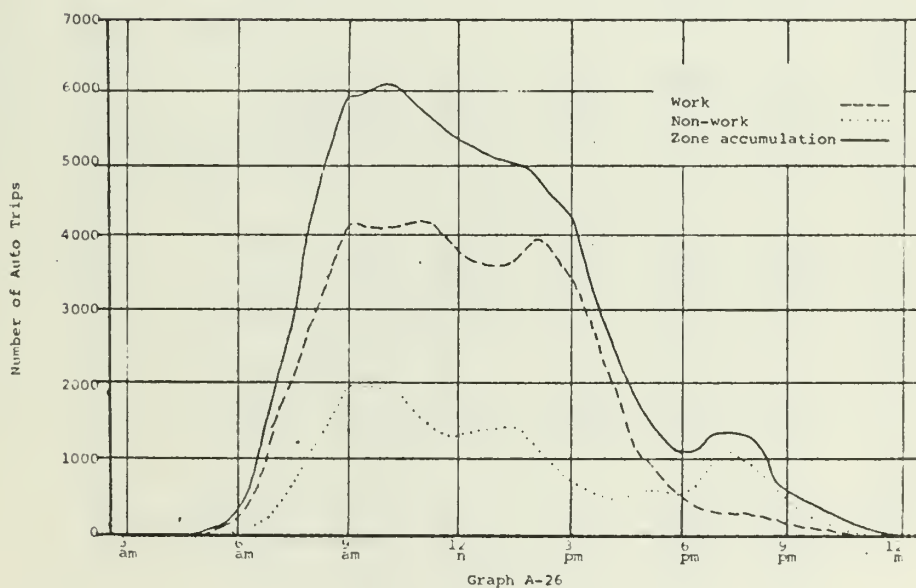
FENWAY - JAMAICA PLAIN

Study Zones 



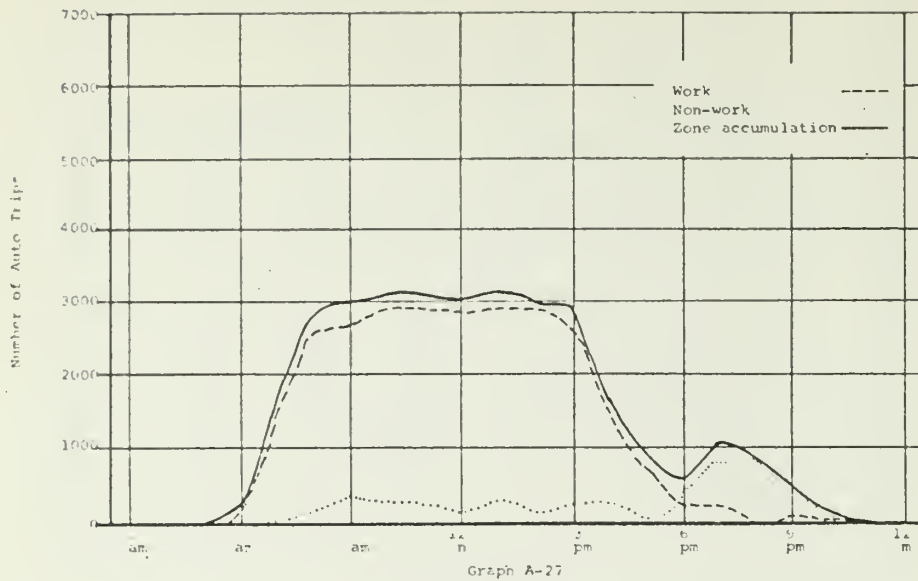
FENWAY-JAMAICA PLAIN (114)

1963 AUTO TRIP ACCUMULATION : PURPOSE

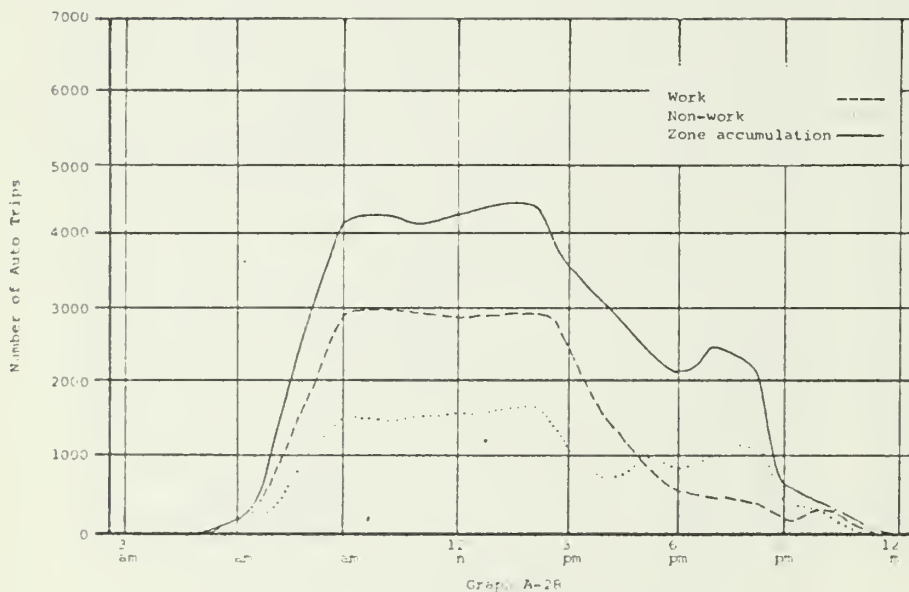


FENWAY-JAMAICA PLAIN (115)

1963 AUTO TRIP ACCUMULATION BY PURPOSE



Graph A-27
FENWAY-JAMAICA PLAIN (116)
1963 AUTO TRIP ACCUMULATION BY PURPOSE



Graph A-28
FENWAY-JAMAICA PLAIN (117)
1963 AUTO TRIP ACCUMULATION BY PURPOSE

TABLE A-5

FENWAY-JAMAICA PLAIN

1963 24 HOUR PARKING USAGE BY TYPE

Zone	Free	Paid	Total	Free	Paid	Total	Free	Paid	Total	TOTAL
114	3992	469	4461	6143	882	7025	95	96	191	11677
%	34.2	4.0	38.2	52.6	7.6	60.2	.8	.8	1.6	
115	4926	354	5280	8807	1158	9965	158	212	370	15615
%	31.5	2.3	33.8	56.4	7.4	63.8	1.0	1.4	2.4	
116	3342	290	3632	5327	687	6014	156	16	172	9818
%	34.0	3.0	37.0	54.2	7.0	61.2	1.6	.2	1.8	
117	4820	870	5690	4508	1400	5908	16	295	311	11909
%	40.5	7.3	47.8	37.8	11.8	49.6	.1	2.5	2.6	
ALL	17080	1983	19063	24785	4127	28912	425	619	1044	49019
%	34.8	4.1	38.9	50.6	8.4	59.0	.8	1.3	2.1	

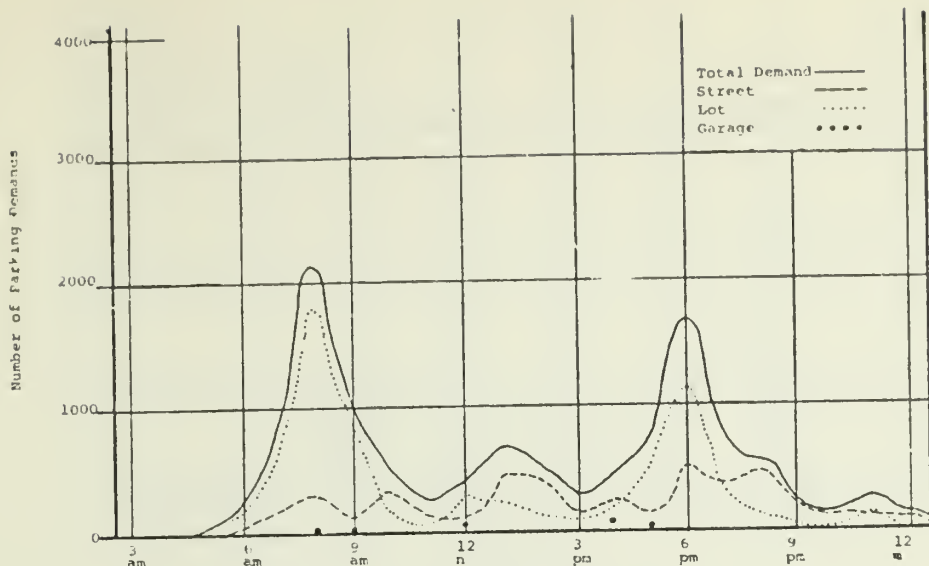
from a high of 47.8% to a low of 33.8% and off-street varied from a high of 63.8% to a low of 49.6%. Garage parking usage was not significant.

The hourly usage peaks by parking type are portrayed by Graphs A-29 through A-32. Two distinct peaks occurred in Zone 114 at 8:00 AM and 6:00 PM with a minor peak at 1:00 PM. Zone 115 also peaked at 8:00 AM; however, it had three minor afternoon peaks at 2:00 PM, 5:00 PM and 7:00 PM. Zones 116 and 117 had morning peaks occurring at 7:00 AM and 8:00 AM respectively. Zone 116 had several afternoon peaks, each increasing to a peak at 7:00 PM, while Zone 117 had two declining afternoon peaks.

PURPOSE OF TRIPS THAT PARKED

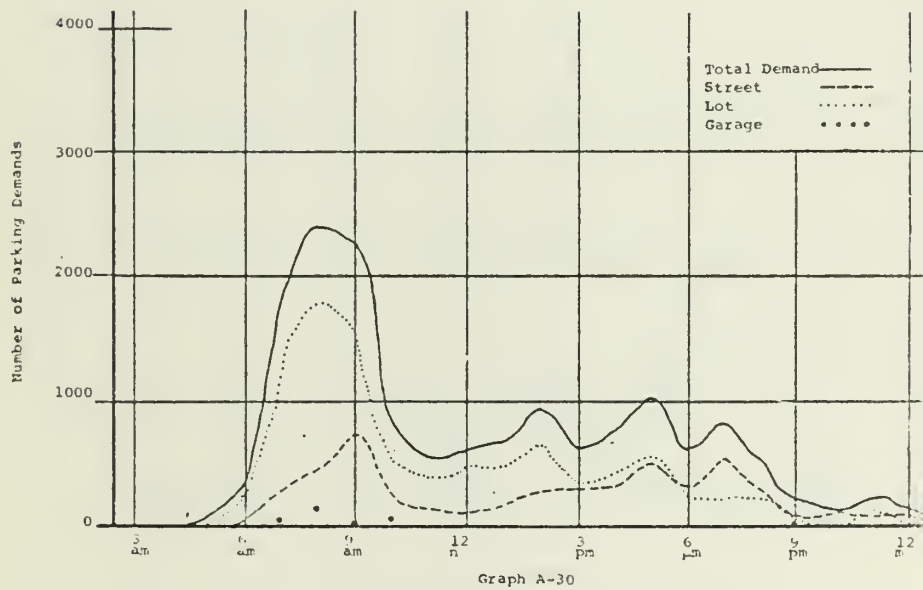
The study of trips by purpose to Zones 114, 115, 116 and 117 revealed that there were for the combined total, 19,701 work vs. 24,069 non-work trips. The plotting of 'ins' for the four zones as shown on Graphs A-33 through A-36 indicated three zones with work trip peaks at 8:00 AM; Zone 116 peaked at 7:00 AM. Two zones - 115 and 117 - had secondary peaks at 2:00 PM and 1:00 PM respectively.

Each zone had several peaks in the non-work category. Zone 114 had two peaks of almost equal size at 8:00 AM and 6:00 PM. Both Zones 115 and 117 had peaks at 8:00 AM with secondary peaks in the afternoon. The major non-work peak



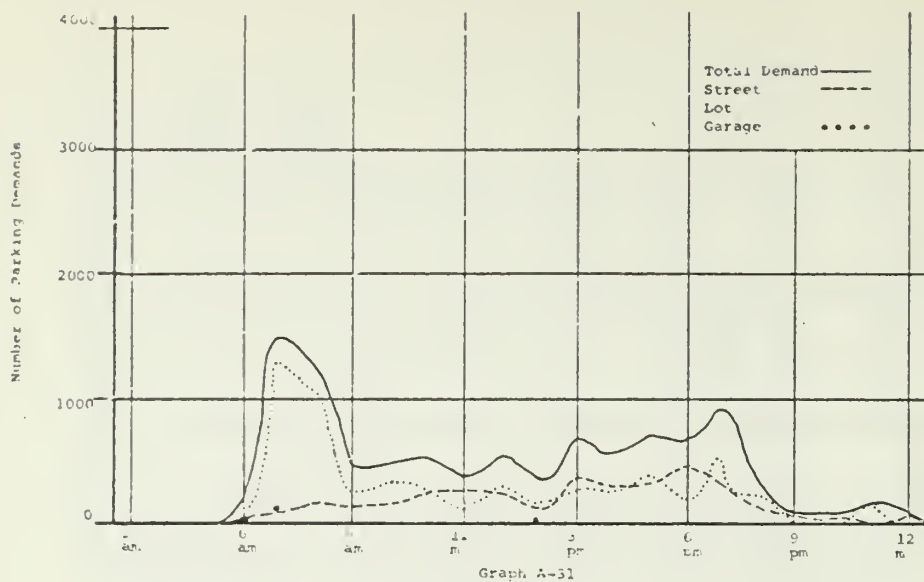
FENWAY-JAMAICA PLAIN (114)

1966 HOURLY PARKING DEMAND BY PARKING TYPE

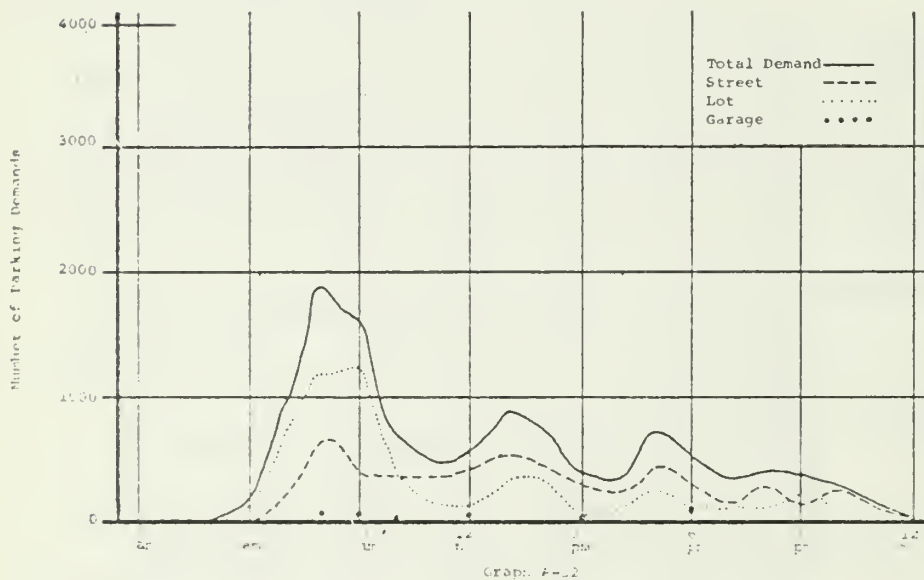


FENWAY-JAMAICA PLAIN (115)

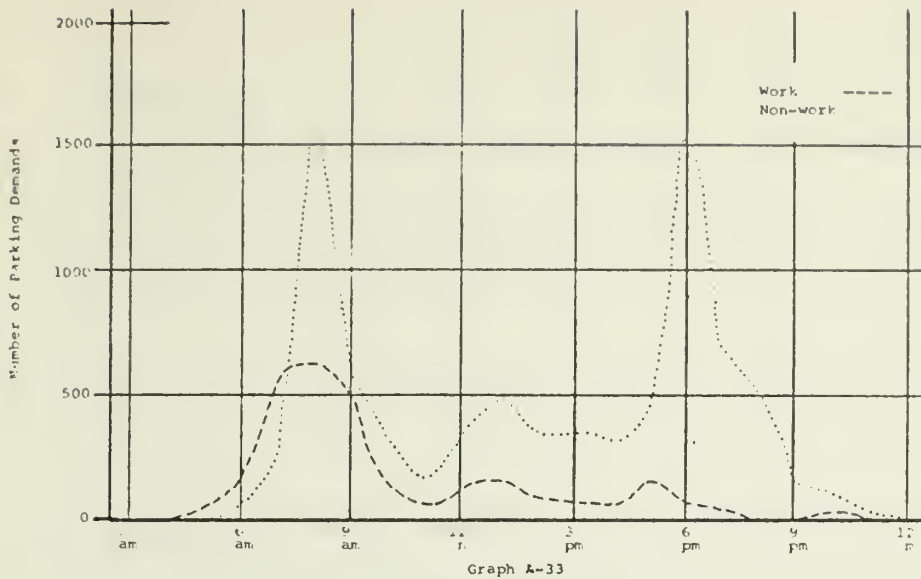
1963 HOURLY PARKING DEMAND BY PARKING TYPE



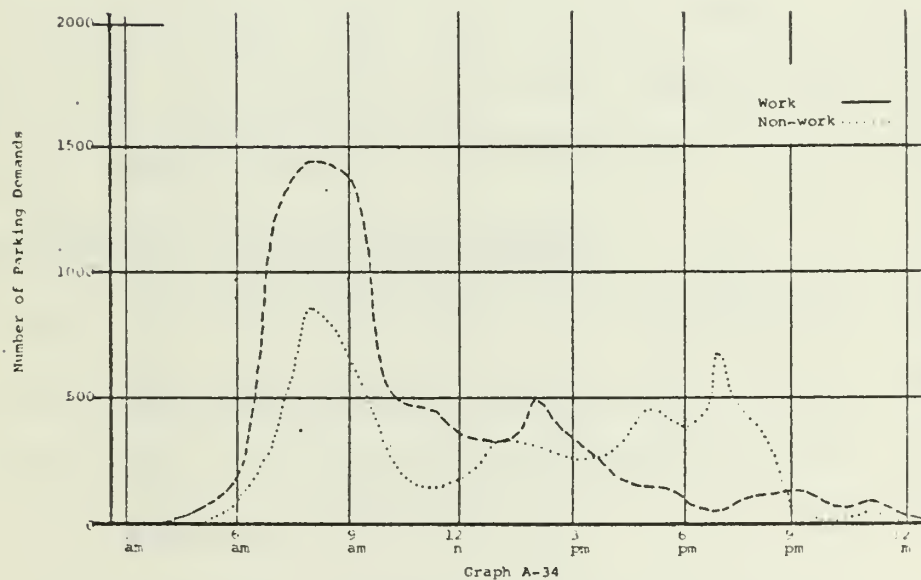
FENWAY-JAMAICA PLAIN (11e)
1963 HOURLY PARKING DEMAND BY PARKING TYPE



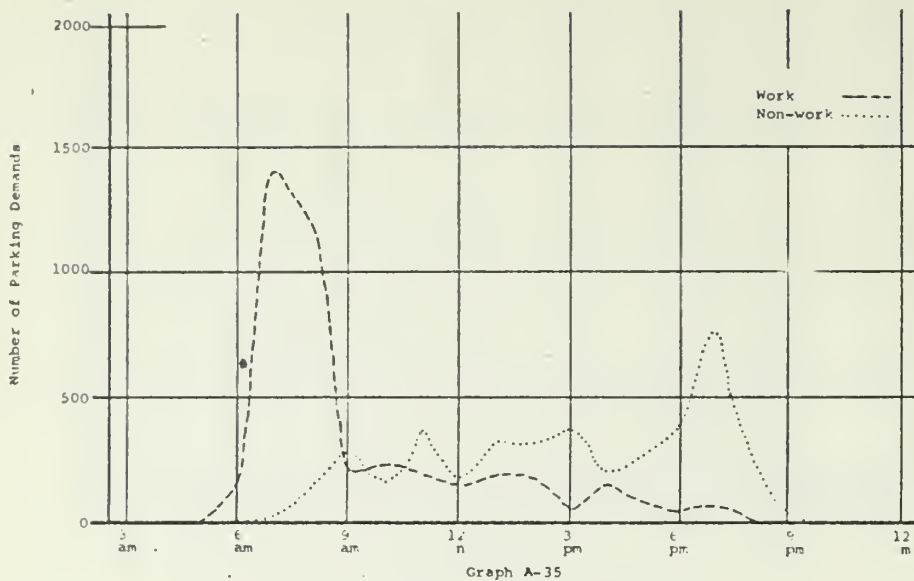
FENWAY-JAMAICA PLAIN (11f)
1963 HOURLY PARKING DEMAND BY PARKING TYPE



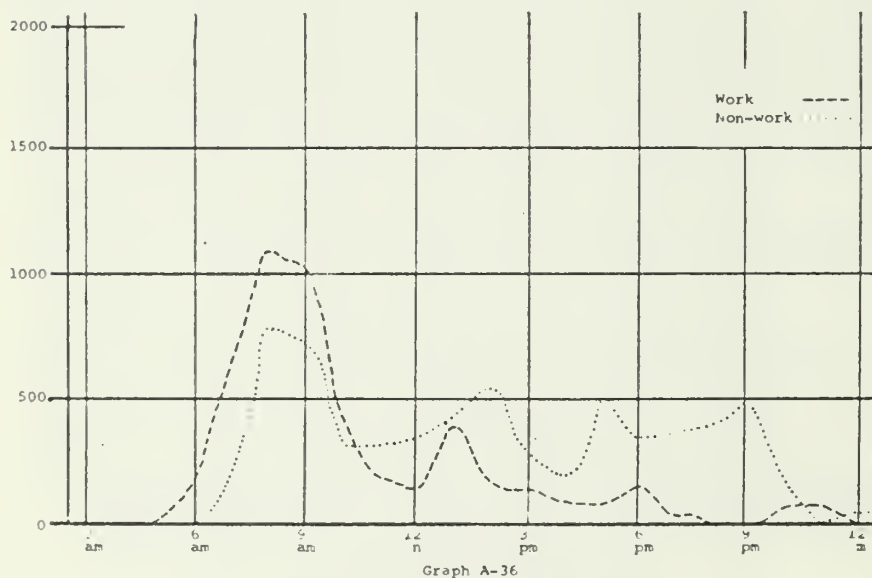
Graph A-33
FENWAY-JAMAICA PLAIN (114)
1963 HOURLY PARKING DEMAND BY PURPOSE



Graph A-34
FENWAY-JAMAICA PLAIN (115)
1963 HOURLY PARKING DEMAND BY PURPOSE



FENWAY-JAMAICA PLAIN (116)
1963 HOURLY PARKING DEMAND BY PURPOSE



FENWAY-JAMAICA PLAIN (117)
1963 HOURLY PARKING DEMAND BY PURPOSE

for Zone 116 was at 7:00 PM.

Trip characteristics were further tabulated by eight purpose categories (Table A-6). The four zone total of work trips represented 34.8% of all trips. The four zone total for non-work trips amounted to 42.5% while 'other' trips constituted a significant 22.7%.

The work trips for each zone ranged from a high of 39.9% in Zone 115 to a low of 22.5% in Zone 114. Non-work trips ranged from 65.9% to 29.3%. Of the non-work categories school purposes in Zone 114 was the largest, amounting to 40.2%. Personal Business was also a significant category in all four zones. Shopping showed attraction strength in only one zone - 116.

Of all the 1963 auto driver trips entering the four study zones, more than 77% of them required some form of parking. (Table A-6).

1990 ESTIMATED PARKING SPACE DEMAND

The 1990 estimated parking space demand was calculated for both 1990 Transportation Plans A and C. The space estimating factor technique⁽¹⁾ was employed to make these determinations.

An estimating factor value was determined for each of the four zones in Fenway-Jamaica Plain.

(1) See Chapter III for details of Methodology

FENWAY JAMAICA PLAIN

1963 TRIPS BY PURPOSE TO ZONES

WORK		NON-WORK					OTHER			
Zone	Work	Per. Bus.	Rec.	Sch.	Soc.	Shop Conv.	Shop GAF	Non- Work Total	Other 0-6-9	TOTAL
	1	2	3	4	5	7	8			
114	2783	1085	1478	4968	280	208	113	8132	1438	12353
%	22.5	8.8	12.0	40.2	2.3	1.7	.9	65.9	11.6	
115	7780	1639	56	1876	1920	182	55	5728	6011	19519
%	39.9	8.4	.3	9.6	9.8	.9	.3	29.3	30.8	
116	4236	631	533	-	401	316	1837	3718	3261	11215
%	37.7	5.6	4.8	-	3.6	2.8	16.4	33.2	29.1	
117	4902	2818	294	2276	674	214	214	6490	2131	13523
%	36.2	20.8	2.2	16.8	5.0	1.6	1.6	48.0	15.8	
TOTAL	19701	6173	2361	9120	3275	920	2219	24068	12841	56610
	34.8	10.9	4.2	16.1	5.8	1.6	3.9	42.5	22.7	

The factor values are as follows:

Zone 114 --- .342
Zone 115 --- .308
Zone 116 --- .280
Zone 117 --- .325

These factor values were then used to derive the 1990 estimated parking space demands for the study area.

TABLE A-7
FENWAY-JAMAICA PLAIN
1990 ESTIMATED PARKING SPACE DEMAND

ZONE	COMBINED FACTOR VALUE	ESTIMATED DEMAND		
		1963	1990A	1990C
114	.342	4219	5982	5819
115	.308	6025	5642	5727
116	.280	3144	3378	3461
117	.325	4396	6632	6410
TOTAL		17784	21634	21417

The estimated demand for 1990 Plans A and C indicate increases of approximately 20% from 1963. The analysis of the demands in the entire Fenway-Jamaica Plain sector revealed an increase of 16%.

Comparing the estimates of this report for the overall total for zones 114, 116 and 117 with those in the 1968 BRA report reveals that the estimates are nearly the same. The BRA report estimates 15,529 spaces, while this report estimates 15,992 for the 1990 Plans A and 15,690 for 1990 Plan C.

The similar projection of 1990 parking estimates by the BRA and by this report seems to indicate no serious parking problems for this area in 1990.

APPENDIX B

BROCKTON

INTRODUCTION

The city of Brockton, located in the southern portion of the Eastern Massachusetts Region, had a 1960 population of 72,813. The city serves as a central shopping and business area for a number of towns in the immediate vicinity. At one time, shoe manufacturing was its primary industry; however the industrial base has now been diversified.

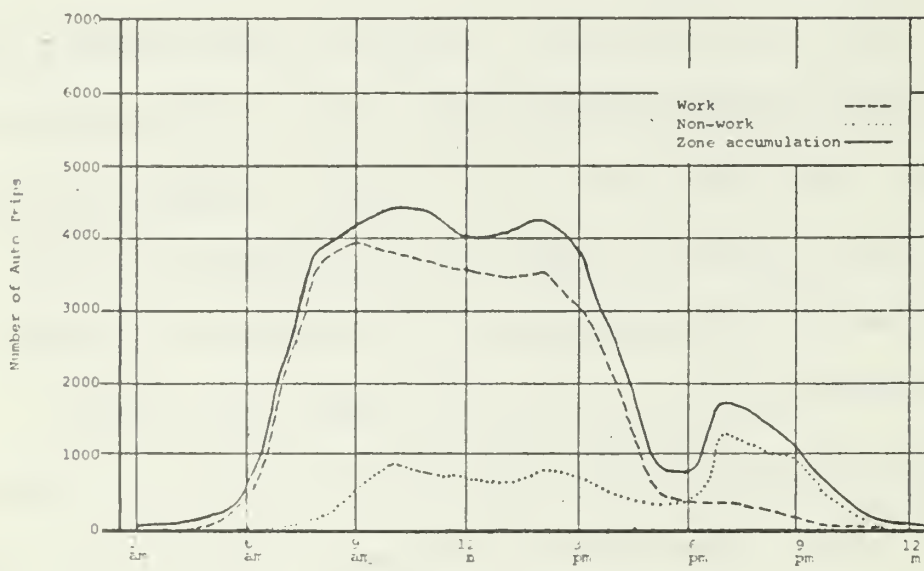
The selected zonal study area in Brockton is Zone 586, which contains the downtown shopping, business and entertainment activities. This area attracts 27% of all auto driver trips made in the city.

Outside of the selected zonal study area of Brockton, three shopping centers and a general auto service area also indicated strong attractions for trips. Because these centers

generally provide the necessary parking facilities, estimated parking space demands were prepared only for Zone 586 (See map).

1963 HOURLY PARKING SPACE DEMAND

The auto accumulation method ⁽¹⁾ was used to estimate 1963 parking space usage for Zone 586 in Brockton. Based on the tabulations of the hourly 'in' and 'out' auto driver trips, the peak demands were calculated. This data is represented on Graph B-1.



Graph B-1
BROCKTON
1963 AUTO TRIP ACCUMULATION BY PURPOSE

Massachusetts D.P.W., Bureau of Transportation Planning and Development

EMRPD

(1) For details on Methodology, see Chapter III

MAP
OF THE CITY OF
BROCKTON,
MASSACHUSETTS.

1965

The Price & Lee Co.,
Publishers
NEW HAVEN-HARTFORD-SPRINGFIELD-NEWARK



Study Zone

MAP 4

The peak auto accumulation for work trips occurred at 9:00 AM with a demand for over 3690 spaces. The non-work peak occurred at 7:00 PM, indicating a demand of nearly 1240 spaces. However, the peak which determines the 1963 estimated parking space demand occurred at 10:00 AM. By summing the hourly work and non-work peak, the zonal peak demand of 4465 spaces was calculated.

1963 PARKING TYPE USAGE

The total 1963 24 hour parking space usage for Zone 586 was 19,858. Of this total, 46.0% comprised on-street parking and 52.9% off-street lots, leaving slightly more than 1% in garage parking. The total usage is expected to be larger than peak demand because of the turnover or multiple usage of each space during a 24 hour period. (Table B-1)

TABLE B-1

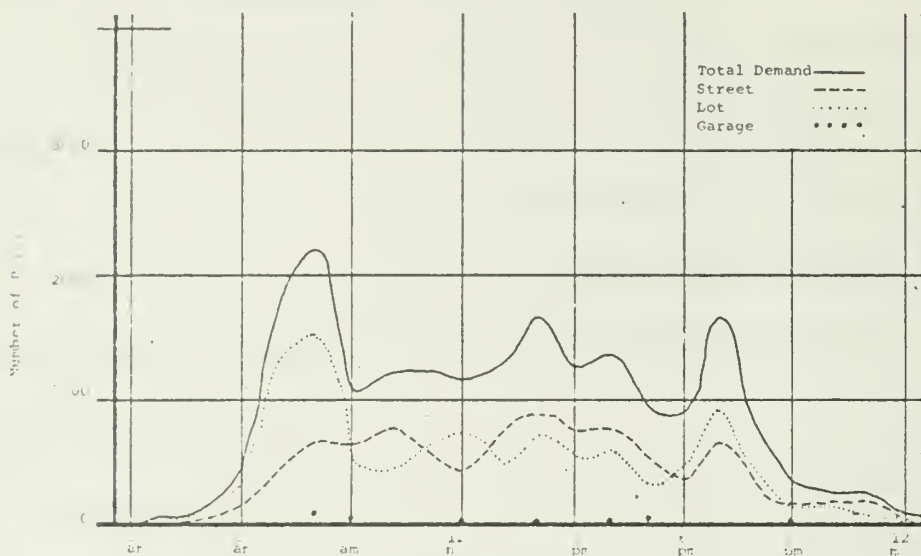
BROCKTON

1963 24 HOUR PARKING USAGE BY TYPE

ZONE	STREET			LOT			GARAGE			GRAND TOTAL
	Free	Paid	Total	Free	Paid	Total	Free	Paid	Total	
586	6109	3016	9125	9664	851	10515	153	65	218	19858
%	30.8	15.2	46.0	48.6	4.3	52.9	.8	.3	1.1	

The hourly usage by parking type indicates peaks at 8:00 AM, 2:00 PM and 7:00 PM as shown by Graph B-2. The greatest demand for lot parking occurs at 8:00 AM and again

at 7:00 PM, while the street demand remains quite consistent with a general peaking in mid-afternoon.



Graph B-2
BROCKTON
1963 HOURLY PARKING DEMAND BY PARKING TYPE

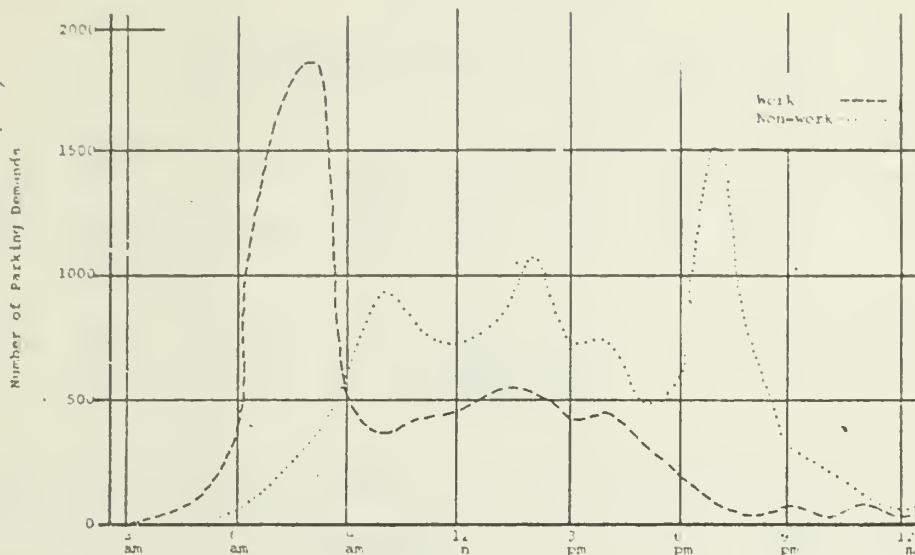
Massachusetts D.P.W., Bureau of Transportation Planning and Development

EMRFP

PURPOSE OF TRIPS THAT PARKED

The study of trips to Zone 586 by purpose revealed that 8462 work vs. 10,973 non-work trips were made. When the hourly 'ins' are plotted as in Graph B-3, the work trip peak occurs at 8:00 AM while the non-work trip peak occurs at 7:00 PM. In addition the non-work trip purposes have secondary peaks at 10:00 AM and 2:00 PM indicating shopping and business parking demands. The significant 7:00 PM non-work peak reflects the

additional demand created by the area's entertainment activities.



Graph B-3
FROCKTON
1963 HOURLY PARKING DEMAND BY PURPOSE

Massachusetts L.P.W., Bureau of Transportation Planning and Development

EMRPP

Trip characteristics were further tabulated by eight purpose categories (Table B-2). The combined non-work categories amounted to 40.0% of the total trips, while work trips, the largest single category, amounted to 30.8%. Of the non-work categories, personal business comprised the largest percentage with 13.3% while the 'school purpose' constituted the least. The two shopping categories combined represented 18.4%. The 'other' trips, which represent 29.1%

of the total zonal trips, indicate that there is a significant amount of serve passenger, change mode and home trip activity.

TABLE B-2

BROCKTON

1963 TRIPS BY PURPOSE TO ZONE 586

Zone	WORK		NON-WORK					OTHER		GRAND TOTAL
	Work 1	Per Bus 2	Rec 3	Sch 4	Soc 5	Shop Conv 7	Shop GAF 8	Total	Other 0-6-9	
586	8462	3664	952	16	1270	1950	3122	10974	7986	27422
%	30.8	13.3	3.4	-	4.6	7.1	11.3	40.0	29.1	

Of all the 1963 auto driver trips entering Zone 586 more than 71% of them required some form of parking. (See Table B-2)

1990 ESTIMATED PARKING SPACE DEMAND

The 1990 estimated demand was calculated for both 1990 Transportation Plans A and C. The space estimating factor technique⁽²⁾ was employed to make these determinations.

The combined accumulation total for Zone 586 was 4,465. By dividing the total zonal 'ins' of 27,422 into 4,465 a space estimating factor value of .163 was determined. This factor value was then used to derive the 1990 estimated parking space demand for Zone 586. (See Table B-3).

The reduction of parking space demand in 1990 for Zone 586 was due to the technique employed to project and distri-

(2) See Chapter III for details of method.

bute trips. This technique assumed that the trends of 1952 to 1963 would continue, producing the 1990 decrease in Zone 586. However, the auto driver trips in 1990 for the whole city of Brockton increased by 18.8%. This indicates that the parking demand in the shopping centers outside of the core area will increase and represent a larger portion of the parking demand than the study zone in 1990.

TABLE B-3
BROCKTON

1990 ESTIMATED PARKING SPACE DEMAND

ZONE	COMBINED FACTOR VALUE	ESTIMATED DEMAND		
		1963	1990A	1990C
586	.163	4465	2824	2822

Based on the possibility that parking demand in Zone 586 in Brockton will decrease in 1990, it is recommended that detailed studies be made of the present parking situation along with the study of the physical and economic condition of the downtown area. In addition the city should establish a program of continuous evaluation so as to be in a position to recommend parking needs as the physical and economic conditions change in the downtown area.

APPENDIX C

CAMBRIDGE

INTRODUCTION

Cambridge, located on the north side of the Charles River opposite the city of Boston, had a 1960 population of 107,716. The location of Harvard and MIT in Cambridge has made the city an academically oriented community. In addition to this, however, the city has developed a large and diverse industrial base.

The four traffic zones selected from Cambridge attracted more than 53% of all the auto driver trips requiring some form of parking in Cambridge. Of these four zones, two are academically oriented - (Zone 215 - Harvard and Zone 218 - MIT), one is industrially oriented - (Zone 219) and one is more typical of a central business area (Zone 221). The remaining zones in the city did not indicate large attraction

although several small areas did show strength. These, however, were not considered for this study.

1963 HOURLY PARKING SPACE DEMAND

The auto accumulation method⁽¹⁾ was used to estimate 1963 parking space demand for Zones 215, 218, 219 and 221 in Cambridge. The peak demands were calculated from the 'in' and 'out' auto driver trips as indicated by Graphs C-1 through C-4.

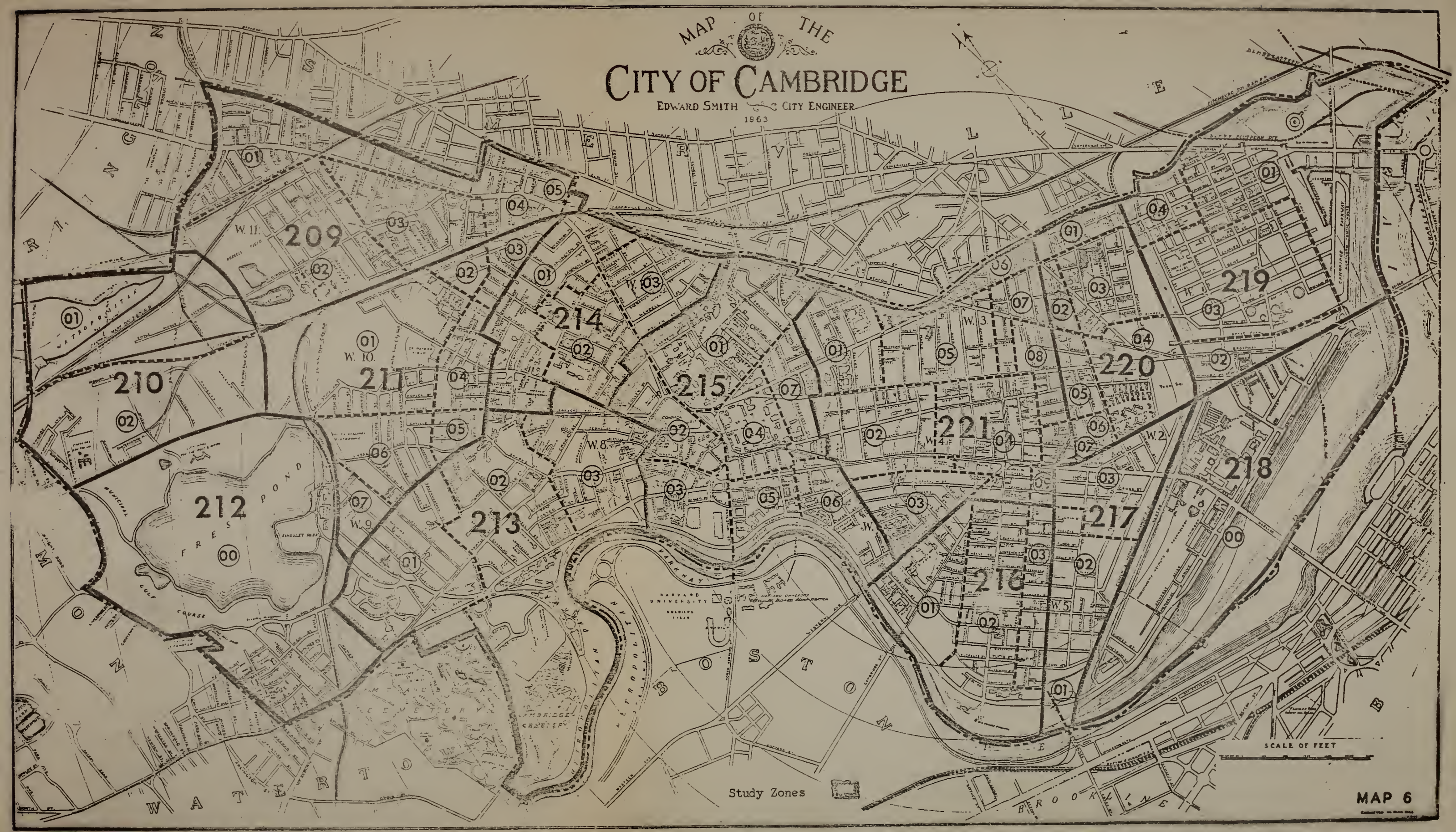
The highest auto accumulation for work trips occurred at 10:00 AM in Zones 215 and 219 which required 3979 and 5306 spaces respectively.

In Zones 218 and 221 the peak demand by work trips occurred at 1:00 PM, requiring 5168 and 2399 spaces respectively. The non-work auto accumulations occurred at 10:00 AM for Zone 215 with 1448 spaces, at 12:00 PM for Zone 219 with 561 spaces and at 8:00 PM for zones 218 and 221, which required 512 and 881 spaces respectively. The time of zonal peaks also varied. In Zones 215 and 219 the peak occurred at 10:00 AM, in Zone 218 at 2:00 PM and in Zone 221 at 12:00 PM.

The total 1963 hourly parking space demand for the four zones was Zone 215 - 5620, Zone 218 - 5612, Zone 219 - 5853 and Zone 221 - 2878 or a combined total of 19,963.

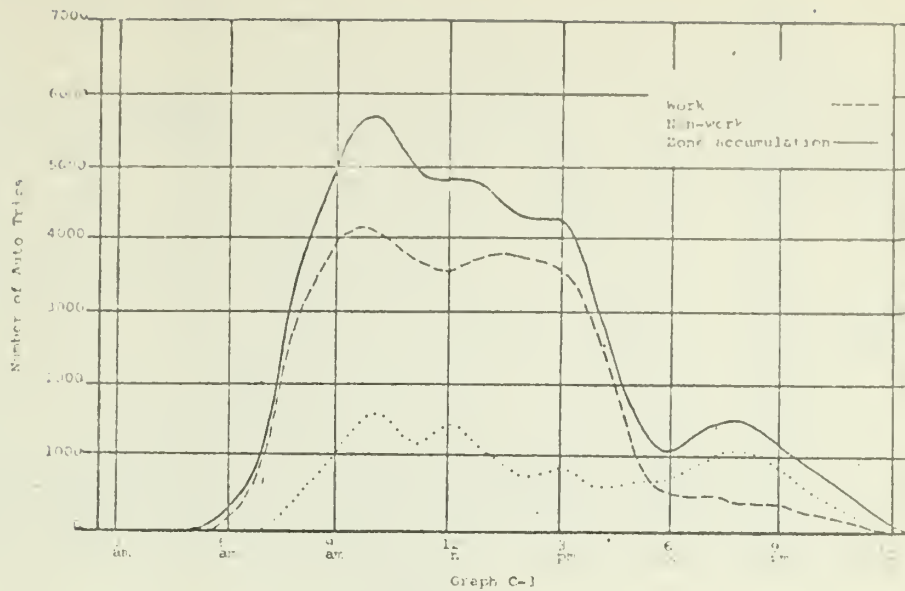
(1) For details on Methodology, see Chapter III

MAP OF THE
CITY OF CAMBRIDGE
EDWARD SMITH CITY ENGINEER
1963

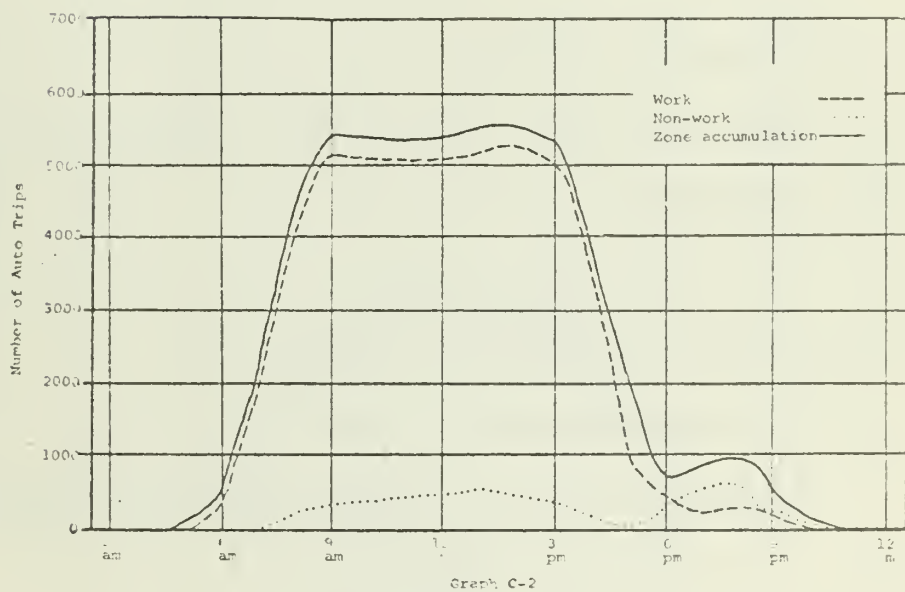


Study Zones

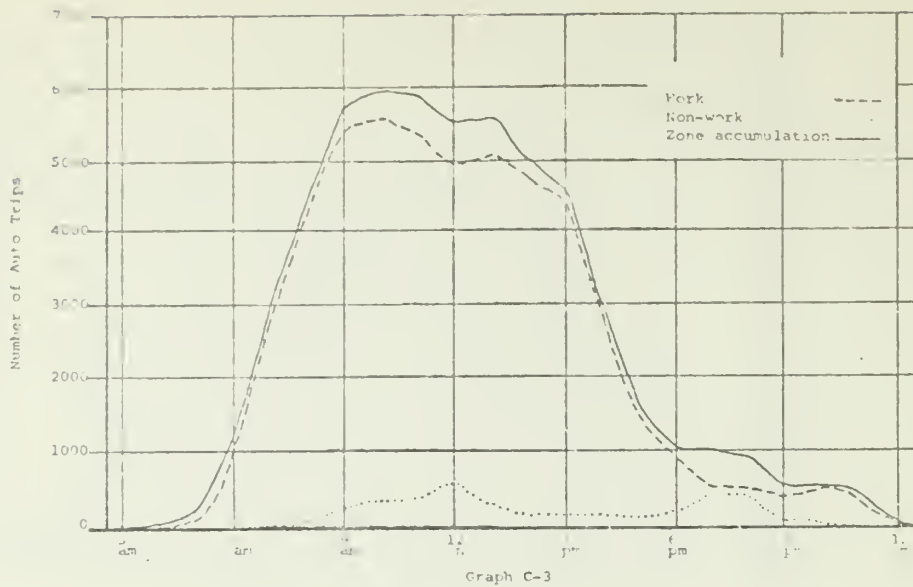
SCALE OF FEET



CAMBRIDGE (215)
1963 AUTO TRIP ACCUMULATION BY PURPOSE

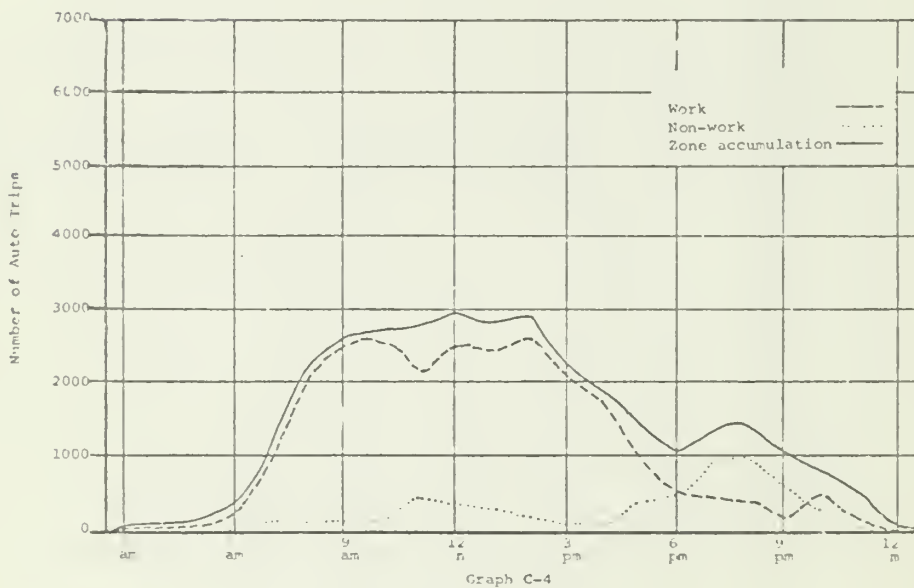


CAMBRIDGE (21A)
1963 AUTO TRIP ACCUMULATION BY PURPOSE



CAMBRIDGE (219)

1963 AUTO TRIP ACCUMULATION BY PURPOSE



CAMBRIDGE (221)

1963 AUTO TRIP ACCUMULATION BY PURPOSE

1963 PARKING TYPE USAGE

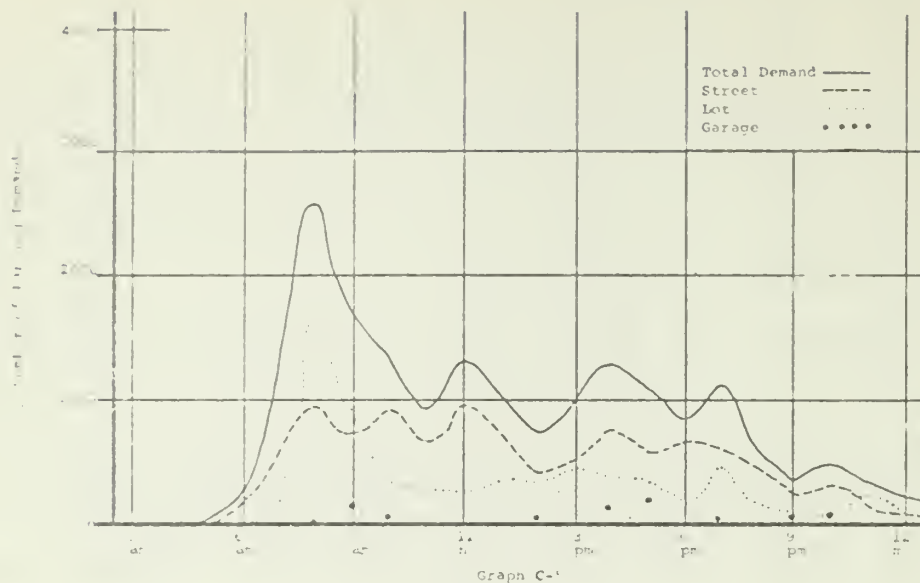
The total 1963 24 hour parking space usage for the combined zones in Cambridge was 58,915. Of this total 49.1% was on-street parking, 48.1% was off-street lots and 2.8% was garage space (Table C-1).

Comparing the usage in the four zones, on-street parking varied from a high of 66.9% in Zone 221 to a low of 25.3% in Zone 218, while lot parking ranged from a high of 72.1% in Zone 218 to a low of 29.8% in Zone 221. Garage parking reached a high of 4.0% in Zone 215; however, its effect on parking usage was negligible. When the combined totals are compared street and lot parking vary only by one percent (street - 49.1% and lot 48.1%).

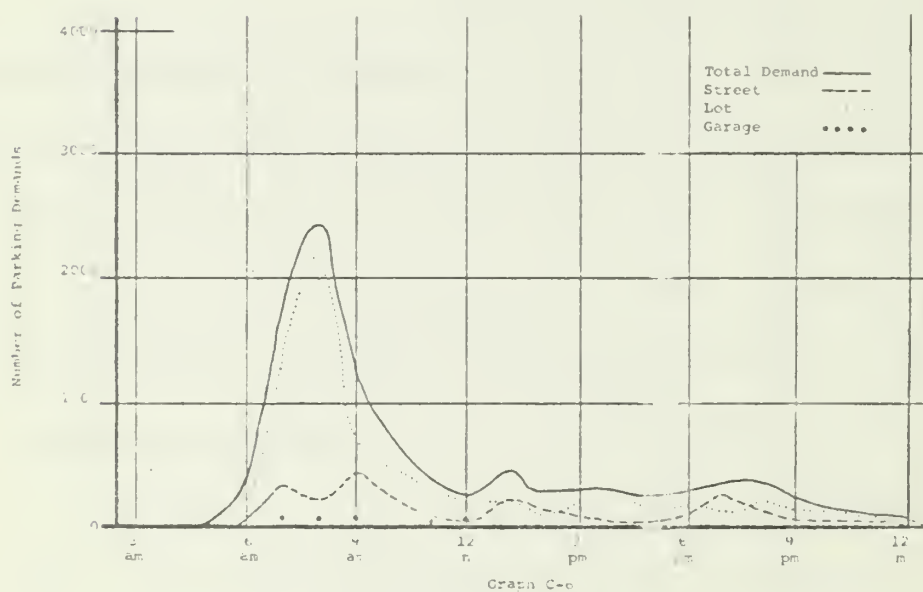
The hourly usage peaks by parking type are portrayed by Graphs C-5, C-6, C-7 and C-8 for Zones 215, 218, 219 and 221. In three zones - 215, 218 and 219 - the highest peaks occur in the morning, while in Zone 221 the highest peak occurs at 5:00 PM. The afternoon peak in Zone 221 reflects this area's function as a central business and shopping district.

PURPOSE OF TRIPS THAT PARKED

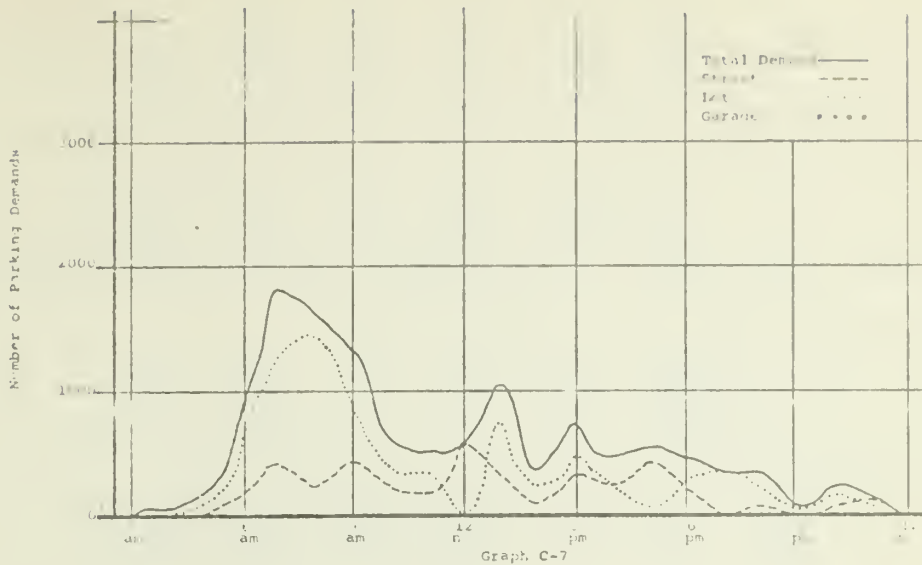
The study of trips by purpose to Zones 215, 218, 219 and 221 revealed that for the combined total, there were 28,432 work trips vs. 20,855 non work trips. The plotting



CAMBRIDGE (215)
1962 HOURLY PARKING DEMAND BY PARKING TYPE

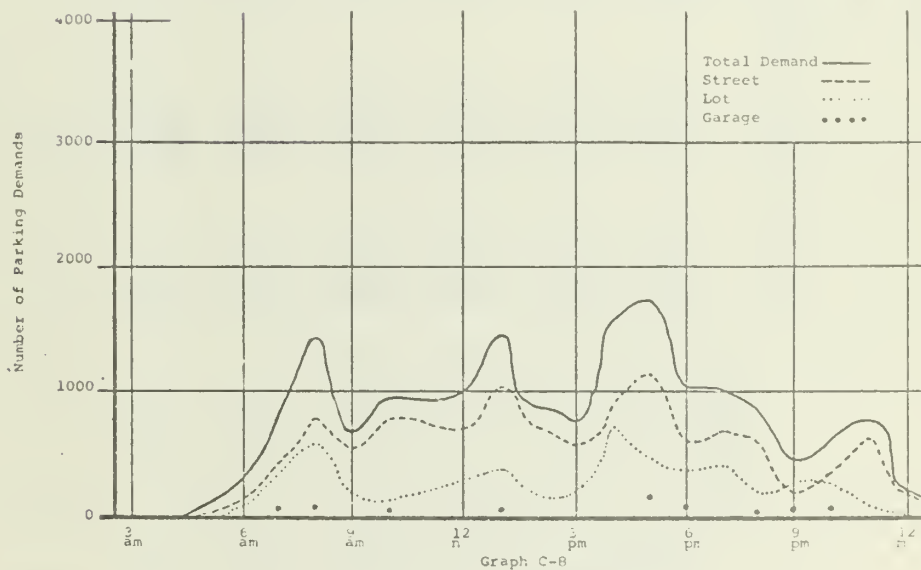


CAMBRIDGE (215)
1963 HOURLY PARKING DEMAND BY PARKING TYPE



CAMBRIDGE (219)

1963 HOURLY PARKING DEMAND BY PARKING TYPE



CAMBRIDGE (221)

1963 HOURLY PARKING DEMAND BY PARKING TYPE

TABLE C-1

CAMBRIDGE

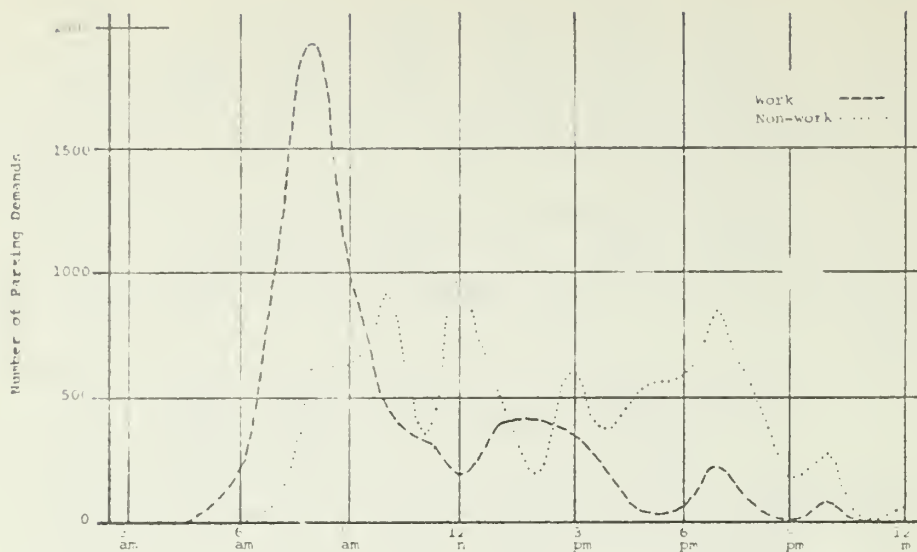
1963 24 HOUR PARKING USAGE BY TYPE

Zone	<u>Street</u>		<u>Lot</u>		<u>Garage</u>		Total	TOTAL
	Free	Paid	Free	Paid	Free	Paid		
215	6901	3582	5893	1553	166	583	749	18678
%	36.9	19.2	31.6	8.3	.9	3.1	4.0	
216	2428	214	7054	484	241	37	278	10458
%	23.2	2.1	67.5	4.6	2.3	.3	2.6	
219	3425	798	7835	401	54	-	54	12513
%	27.5	6.4	62.6	3.2	.4	-	.4	
221	9327	2229	3979	1163	278	289	567	17265
%	54.0	12.9	23.1	6.7	1.6	1.7	3.3	
TOTAL	22081	6823	24761	3602	740	909	1649	58915
%	37.5	11.6	42.0	6.1	1.3	1.5	2.8	

of the 'ins' for the four zones as shown on Graphs C-9, C-10, C-11 and C-12 indicated that the work trip peaks for three zones occurred at 8:00 AM while the work trip peak for Zone 219 was at 7:00 AM. Work trips for the rest of the day were moderately low with the exception of a secondary peak at 1:00 PM in Zone 219. The non-work trip peaks varied from zone to zone. Zone 215 had the greatest peak and the most activity with four distinct peaks; Zone 218 showed the least activities for non-work trips.

Trip characteristics were further tabulated by eight purpose categories. (Table C-2) The four zone total of work trips represented 40.2% of all trips. The combined non-work trips amounted to 29.5%, while a significant 30.3% comprised 'other' trips.

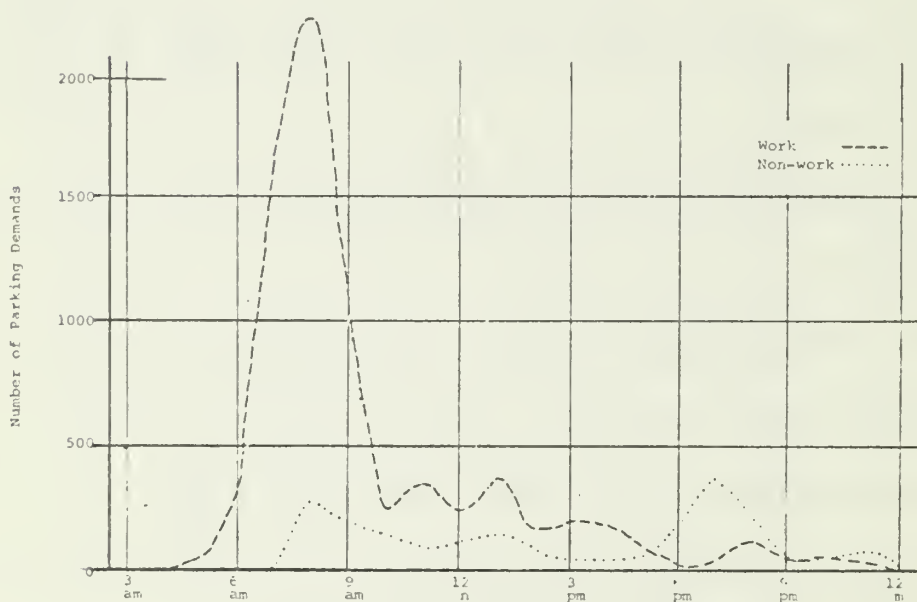
Within the zones the work trips varied from a zonal high of 63.3% to a low of 26.4%. The non-work trip also varied from a low 17.3% to a high of 35.3%. Zones 215 and 218, which are school-oriented, showed significant school trips. Personal business trips were also significant in all zones. In Zones 215 and 221, the category of 'other' trips was important. In Zone 215, 34.5% constituted 'other' trips while Zone 221 had the greatest amount with 41.0%; the remaining two zones totaled 18.5% and 17.3% indicating lesser degree of concern.



Graph C-9

CAMBRIDGE (215)

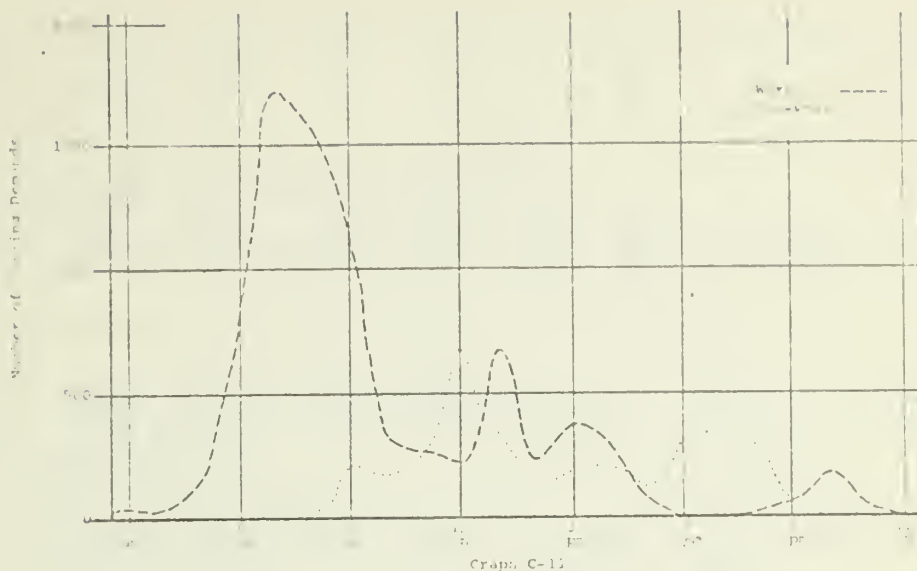
1963 HOURLY PARKING DEMAND BY PURPOSE



Graph C-10

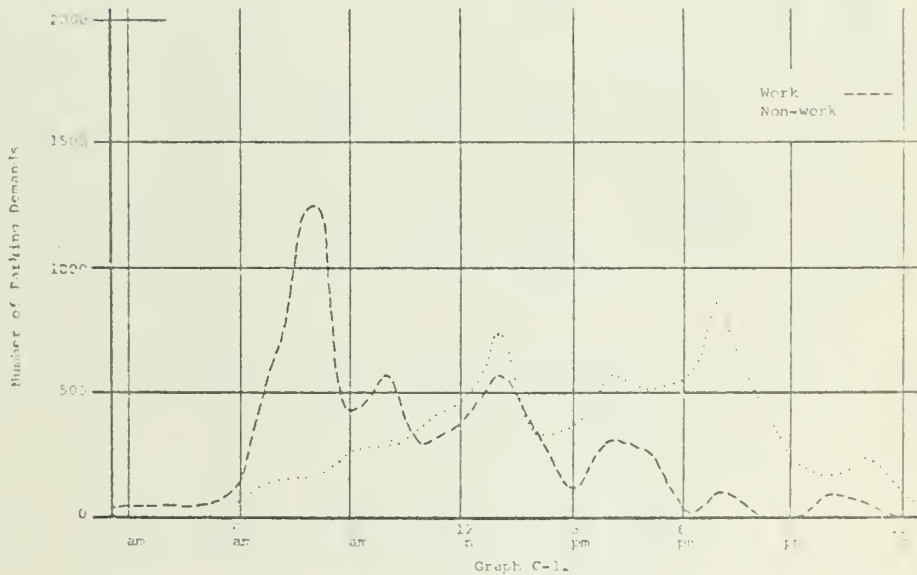
CAMBRIDGE (218)

1963 HOURLY PARKING DEMAND BY PURPOSE



CAMBRIDGE (219)

1963 HOURLY PARKING DEMAND BY PURPOSE



CAMBRIDGE (271)

1963 HOURLY PARKING DEMAND BY PURPOSE

TABLE C-2

CAMBRIDGE

1963 TRIPS BY PURPOSE TO ZONES

ZONE	WORK		NON WORK					OTHER		TOTAL
	Work 1	Per. Bus. 2	Rec. 3	Sch. 4	Soc. 5	Shop Conv. 7	Shop GAF 8	Non- Work total	Other 0-6-9	
215	7092	3044	708	1439	1057	1086	920	8254	8006	23352
%	30.3	13.0	3.0	6.1	4.5	4.6	3.9	35.3	34.2	
218	7445	537	357	953	245	15	35	2142	2188	11775
%	63.3	4.5	3.0	8.0	2.0	.1	.2	18.1	18.5	
219	8236	1216	-	39	263	250	1710	3478	2467	14181
%	58.0	8.5	-	.2	1.8	1.7	12.0	24.5	17.3	
221	5659	2138	481	-	1639	1769	954	6981	8793	21433
%	26.4	9.9	2.2	-	7.6	8.2	4.4	32.5	41.0	
TOTAL	28432	6936	1545	2430	3204	3121	3619	20855	21455	70742
%	40.2	9.8	2.2	3.4	4.5	4.4	5.1	29.5	30.3	

Therefore of all the 1963 auto driver trips entering the four study zones more than 69.0% of them required some form of parking.

1990 ESTIMATED PARKING SPACE DEMAND

The 1990 estimated parking space demand (Table C-3) was calculated for both Transportation Plans A and C. The space estimating factor technique⁽²⁾ was employed to make these determinations.

An estimating factor value for each of the four study zones in Cambridge was determined. The estimating factor values are:

Zone 215 -	.240
Zone 218 -	.477
Zone 219 -	.413
Zone 221 -	.134

These factor values were then used to derive the 1990 estimated parking space demands for the study area.

For Transportation Plans A and C, the four study zones indicated parking space increases of 5% to 13%. The analysis of Cambridge as a whole revealed that its increase would be about 12%. Although this increase for the study area may not appear to indicate a serious situation, the provision of any future parking may well become critical in such a highly urbanized area.

(2) See Chapter III for details of method

Therefore, the general recommendation that parking need be a prime consideration in any development or redevelopment plan is appropriate. In addition, a future detailed study of parking for the city is recommended.

TABLE C-3

CAMBRIDGE

1990 ESTIMATED PARKING SPACE DEMAND

ZONE	COMBINED FACTOR VALUE	ESTMATED DEMAND		
		1963	1990A	1990C
215	.240	5611	5902	6294
218	.477	5612	5436	5759
219	.413	5853	7149	7726
221	.134	2878	2637	2812
TOTAL		19954	21124	22591

APPENDIX D

LAWRENCE

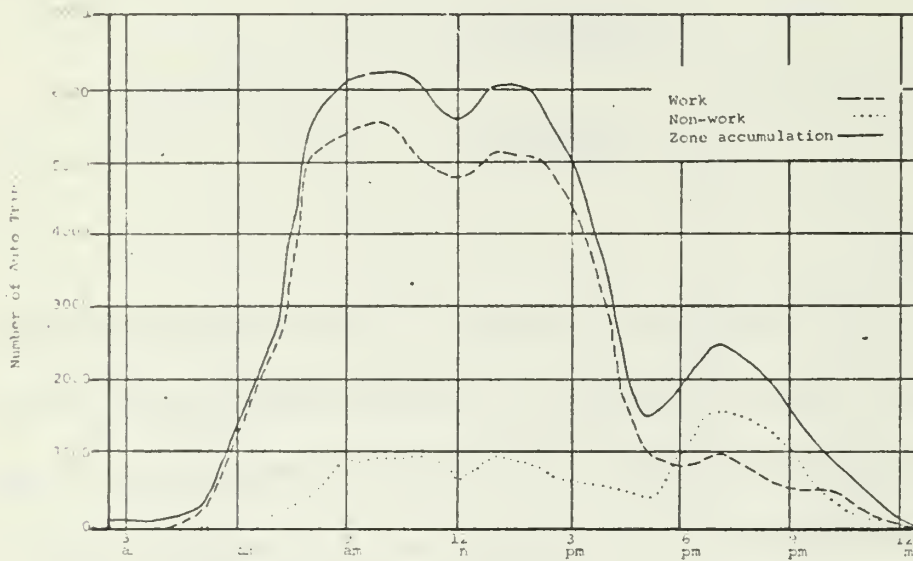
INTRODUCTION

The city of Lawrence, located in the northern section of the region along the banks of the Merrimack River, had a 1960 population of 70,933. In the early development of Lawrence the manufacturing of textiles was its primary industry. Since the exodus of textile manufacturing to the South, Lawrence has been continually diversifying its industrial base. The city today also serves as a shopping center for this portion of the region.

The study area selected in Lawrence is Zone 378. This zone attracted more than 45% of auto driver trips requiring some form of parking in the city. The area contains most of the downtown shopping and business activities. Other zones in Lawrence were too large to warrant any realistic analysis for parking.

1963 HOURLY PARKING SPACE DEMAND

The auto accumulation method⁽¹⁾ was used to estimate 1963 parking space usage for Zone 378 in Lawrence. The peak demands were calculated from the 'in' and 'out' auto driver trips as shown on Graph D-1.



Graph D-1
LAWRENCE
1963 AUTO TRIP ACCUMULATION BY PURPOSE

Massachusetts D.P.W., Bureau of Transportation Planning and Development

EMRPP

The highest auto accumulation by work trips occurred at 10:00 AM with a demand of 5080 spaces. The non-work peak occurred at 7:00 PM with a demand for 1485 spaces. The combined zonal peak was at 10:00 AM with a demand of 6275

(1) For details on Methodology, see Chapter III



MAP OF THE CITY
OF
LAWRENCE MASS.

Study Zones

1965

SCALE

City Engineer's Dept.
Santo J. Nicolosi, City Engineer

MAP II

spaces. This combined zonal peak was determined by summing the hourly accumulation for both work and non-work trips.

1963 PARKING TYPE USAGE

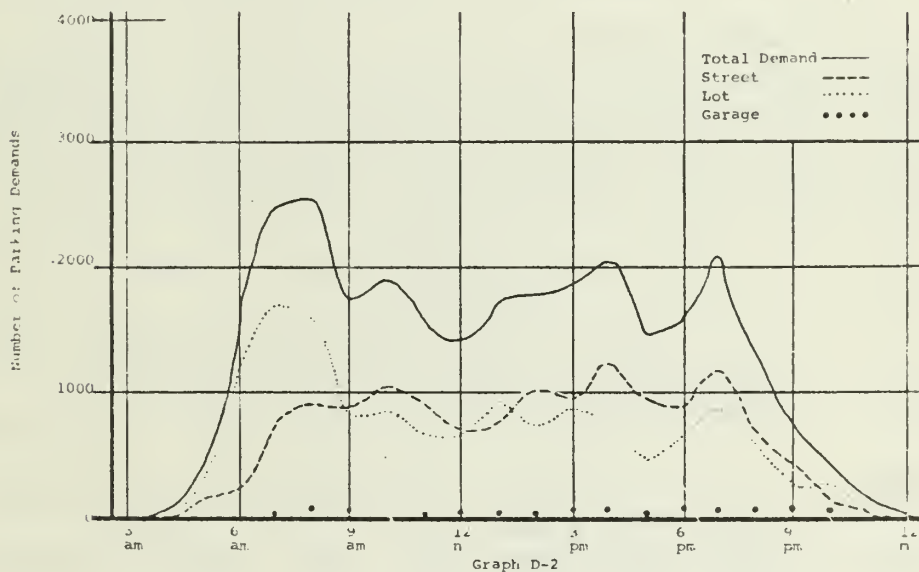
The total 1963 24 hour parking space usage for Zone 378 was 28,892. Of this total, 49% constituted on-street parking 49.2% was off-street, and nearly 2% was in garage parking.

TABLE D-1

LAWRENCE

1963 24 HOUR PARKING USAGE BY TYPE

Zone	Free	Paid	Total	Free	Paid	Total	Free	Paid	Total	TOTAL
378	9472	4678	14150	12807	1428	14235	228	279	507	28892
%	32.8	16.2	49.0	44.3	4.9	49.2	.8	1.0	1.8	



LAWRENCE

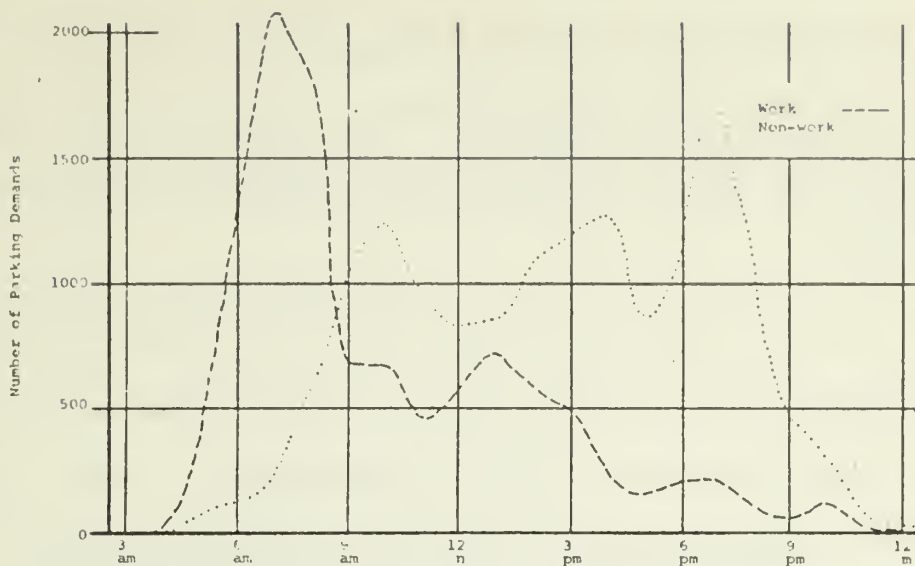
1963 HOURLY PARKING DEMANDS BY PARKING TYPE

The hourly usage by parking type indicates peaks at 8:00 AM, 4:00 PM and 7:00 PM as shown on Graph D-2. The peak usage for lot parking occurs at 7:00 AM while street parking peak usage occurs at 4:00 PM. The level usage by parking type remains quite constant from 9:00 AM to 8:00 PM at about 1650 spaces.

PURPOSE OF TRIPS THAT PARKED

The study of trips to Zone 378 by purpose revealed that of the 26,258 trips requiring parking, 10,948 were work and 15,310 were non-work trips. When the hourly 'ins' are plotted as on Graph D-3 the work trip peak occurred at 7:00 AM, while non-work trip peaks occurred at 10:00 AM, 4:00 PM and the largest at 7:00 PM. The mid-morning and mid-afternoon non-work peaks reflect the business and shopping activities of Zone 378. The larger 7:00 PM peak for non-work indicates that the Lawrence downtown area has significant evening activities.

Trip characteristics were further tabulated by eight purpose categories (Table D-2). Work trips to Zone 378 constituted 29.2% of the zone's total, while the combined non-work categories amounted to 40.9%. Of the non-work categories Personal Business was the largest with 13.4%, reflecting the large business activities in Zone 378. The combined shopping categories constituted 18.7%. The 'other' trips have significance in that they represented 29.8% of the zone's total trips.



Graph D-3
LAWRENCE
1963 HOURLY PARKING DEMAND BY PURPOSE

Massachusetts D.P.W., Bureau of Transportation Planning and Development EMRFP

Therefore, of all the 1963 auto driver trips entering Zone 378 more than 71% of them required some form of parking.

TABLE D-2

LAWRENCE

1963 TRIPS BY PURPOSE TO ZONE 378

ZONE	WORK		NON-WORK					OTHER		TOTAL
	Work 1	Per Bus 2	Rec 3	Sch 4	Soc 5	Shop Conv 7	Shop GAF 8	Non- Work Total	Other 0-6-9	Total
378	10948	5036	1123	240	1872	3341	3698	15310	11170	37428
%	29.2	13.4	2.9	.6	5.0	8.9	9.8	40.9	29.8	

1990 ESTIMATED PARKING SPACE DEMAND

The 1990 estimated parking space demand (Table D-3) was calculated for both 1990 Transportation Plans A and C. The space estimating factor technique was employed to make these determinations.

The combined auto accumulation total for Zone 378 was 6275. Dividing this by the total 'ins' of 37,428, a space estimating factor value of .167 was determined. This factor value was then used to derive the 1990 estimated parking space demand for Zone 378.

TABLE D-3

LAWRENCE

1990 ESTIMATED PARKING SPACE DEMAND

ZONE	COMBINED FACTOR VALUE	ESTIMATED DEMAND		
		1963	1990A	1990C
378	.167	6275	3054	3083

The reduction of parking demand in 1990 for Zone 378 was a result of the technique employed to project and distribute trips. This technique assumed that the trends of 1952 to 1963 would continue, thereby producing more than a 50% decrease in 1990. The analysis of auto driver trips in the entire city also revealed a decrease in demand of more than 30%. These figures all tend to indicate that the Lawrence commercial and industrial activities may be in a declining trend. However,

if the trend is changed by future development of redevelopment planning it is recommended that parking needs be one of the prime considerations. Consideration should be given to the detailed parking report which the city of Lawrence is currently undertaking.

APPENDIX E

LOWELL

INTRODUCTION

The city of Lowell, located along the Merrimack River in the northwestern section of the EMRPP region, had a population of 92,107 in 1960. Lowell has always been an industrial city with textiles being the major industry. However, since the move of textiles to the South, Lowell has been actively diversifying its industrial base.

The area selected for analysis consists of Zones 398 and 406. These two zones attracted more than 37% of all the trips made in the Lowell area requiring some form of parking. Two other zones (403 and 399) indicated attraction powers; however, their large size precluded any effective parking analysis.

The two selected study zones (398 and 406) represent a majority of the central business district and a large portion

of Lowell's industrial complex. The Lowell downtown area serves as a shopping center for the surrounding communities which are outside of the Boston core influence.

1963 HOURLY PARKING SPACE DEMAND

The auto accumulation method⁽¹⁾ was used to estimate 1963 parking space demand for Zones 398 and 406 in Lowell. The peak demands were calculated from the 'in' and 'out' auto driver trips as portrayed by Graphs E-1 and E-2.

The highest auto accumulation by work trips in Zone 398 occurred at 11:00 AM which indicated a demand for 2519 spaces. In Zone 406 the peak occurred at 10:00 AM with a demand for 1983 spaces. The non-work peak occurred at 7:00 PM in both zones. The non-work peak demand was 597 spaces for Zone 398 and 556 spaces for Zone 406. The zonal peak for each zone occurred during the same time period as did the work trip peaks. The 1963 estimated parking space demand of 3177 for Zone 398, and 2437 for Zone 406 combined to a total of 5614.

1963 PARKING TYPE USAGE

The total 1963 24 hour parking space usage for the two zones in Lowell was 22,814. Of this combined total 46.9% constituted on-street parking and 52.6% was off-street. Garage parking was negligible with 0.5%. (Table E-1).

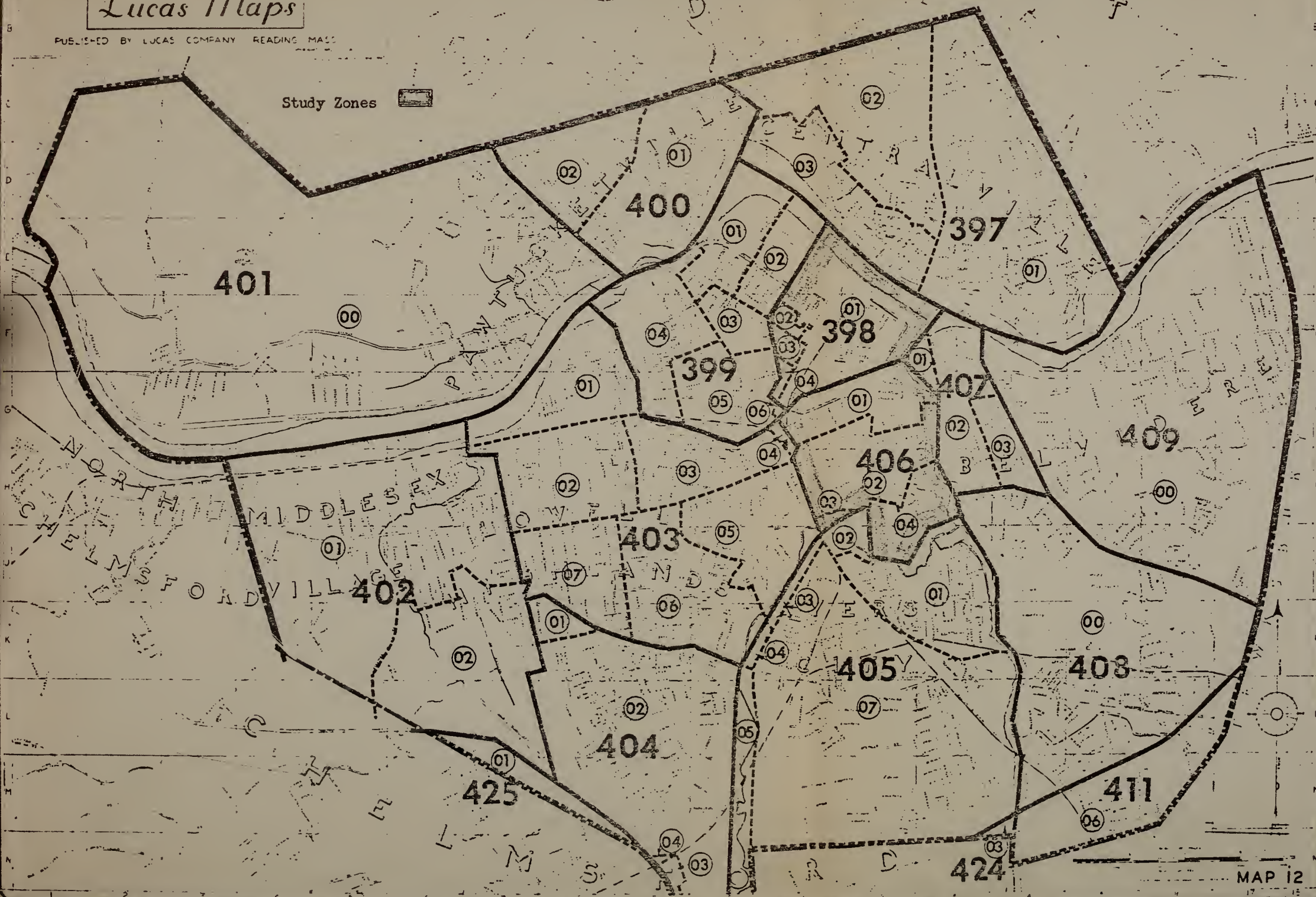
(1) For details on Methodology, see Chapter III

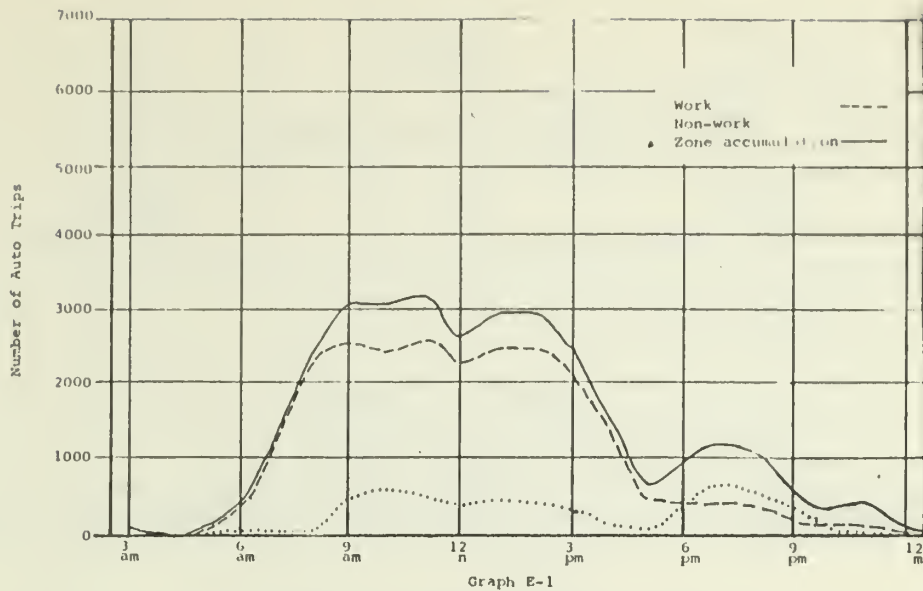
CITY OF
LOWELL, MASS.

Lucas Maps

PUBLISHED BY LUCAS COMPANY READING, MASS.

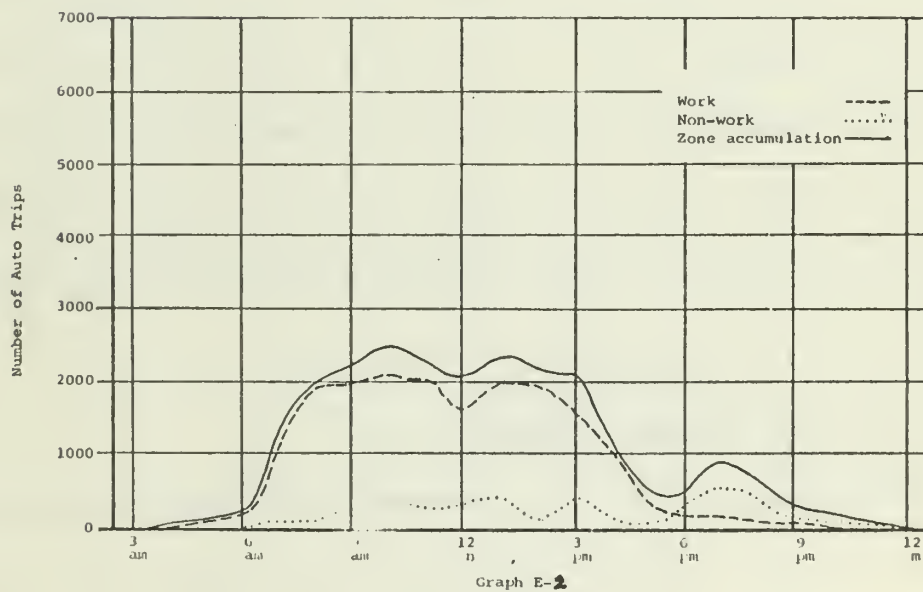
Study Zones





LOWELL (398)

1963 AUTO TRIP ACCUMULATION BY PURPOSE



LOWELL (406)

1963 AUTO TRIP ACCUMULATION BY PURPOSE

TABLE E-1

LOWELL

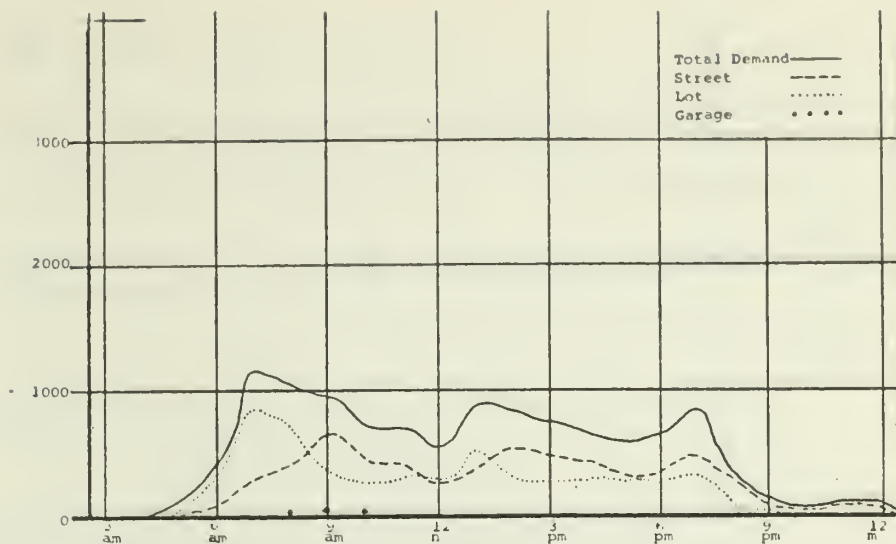
1963 24 HOUR PARKING USAGE BY TYPE

Zone	STREET			LOT			GARAGE			TOTAL
	Free	Paid	Total	Free	Paid	Total	Free	Paid	Total	
398	3495	2649	6144	4501	1028	5529	-	49	49	11722
%	29.8	22.6	52.4	38.4	8.8	47.2	-	.4	.4	
406	3582	975	4557	6013	447	6460	75	-	75	11092
%	32.3	8.8	41.1	54.2	4.0	58.2	.7	-	.7	
TOTAL	7077	3624	10701	10514	1475	11989	75	49	124	22814
%	31.0	15.9	46.9	46.1	6.5	52.6	.3	.2	.5	

Graphs E-3 and E-4 portray the hourly usage peaks by parking type for Zones 398 and 406. Three peaks developed in Zone 398 at 7:00 AM, 1:00 PM and 7:00 PM. The 7:00 AM and 1:00 PM peaks declined gradually indicating a relatively constant level of parking usage. This was not as true in Zone 406 which had several peaks; the major peak was at 7:00 AM with lesser declining peaks at 1:00 PM, 4:00 PM and 7:00 PM. The hourly peak usage in Zone 398 would indicate more short term parking than the peaks in Zone 406.

PURPOSE OF TRIPS THAT PARKED

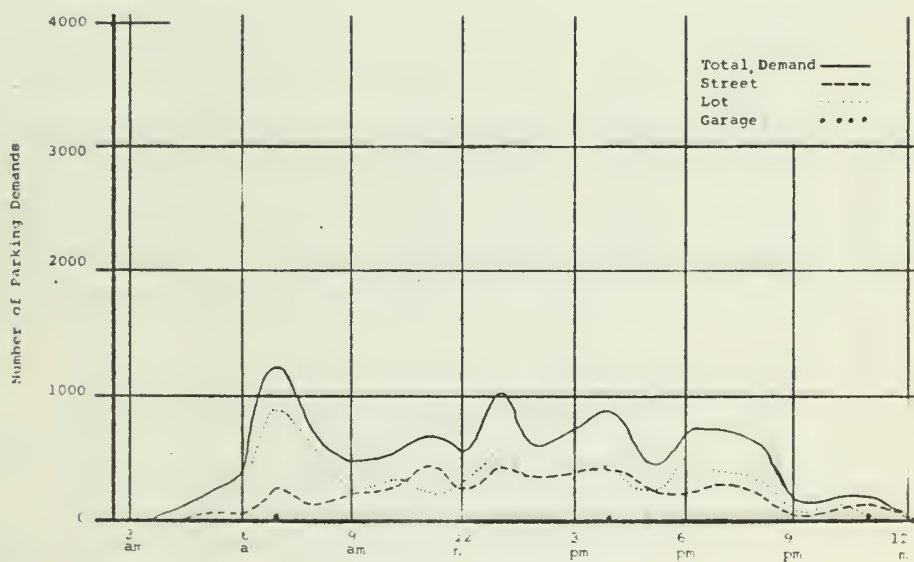
The study of trips by purpose to Zones 398 and 406 revealed that the combined total was 9,029 work vs. 12,336 non-work trips. When the hourly 'ins' were plotted as in Graphs E-5 and E-6, the work trip peaks occurred at 7:00 AM in Zone 398 and at 8:00 AM in Zone 406. The non-work trip peak in



Graph E-3

LOWELL (398)

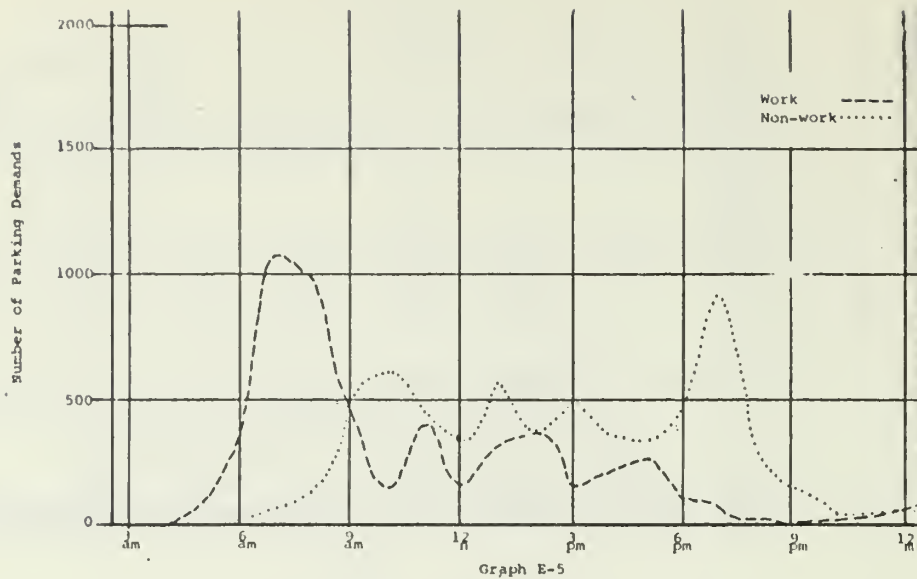
1963 HOURLY PARKING DEMAND BY PARKING TYPE



Graph E-4

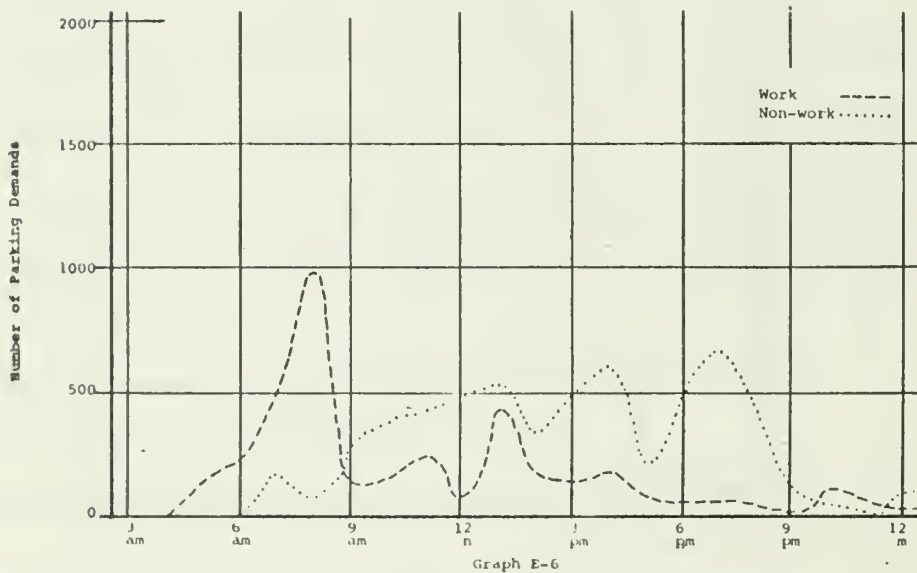
LOWELL (406)

1963 HOURLY PARKING DEMAND BY PARKING TYPE



LOWELL (398)

1963 HOURLY PARKING DEMAND BY PURPOSE



LOWELL (406)

1963 HOURLY PARKING DEMAND BY PURPOSE

both zones occurred at 7:00 PM; each zone had several other less significant non-work peaks.

Trip characteristics were further tabulated by eight purpose categories (Table E-2). In the two zones total work trips amounted to 31.5% of the total trips while the combined non-work amounted to 42.8%. The 'other' trips represented 25.7%.

TABLE E-2

LOWELL

1963 TRIPS BY PURPOSE TO ZONES

ZONE	WORK	NON-WORK						OTHER		GRAND TOTAL
	Work 1	Per Bus. 2	Rec. 3	Sch. 4	Soc. 5	Shop Conv. 7	Shop GAF 8	Non- Work Total	Other 0-6-9	
398	5161	2615	544	68	341	848	1845	6261	3163	14585
%	35.3	17.9	3.7	.4	2.3	5.8	12.6	42.9	21.6	
406	3918	2067	229	39	600	1442	1698	6075	4260	14253
%	27.4	14.5	1.6	.2	4.2	10.1	11.9	42.6	29.8	
TOTAL	9079	4682	773	107	941	2290	3543	12336	7423	28838
%	31.5	16.2	2.7	.4	3.3	7.9	12.3	42.8	25.7	

Both zones had almost equal amount of combined non-work trips (Zone 398 - 42.9%, Zone 406 - 42.6%). Personal Business constituted the largest non-work category in both zones - 17.9% in Zone 398 and 14.5% in Zone 406. The work trips differed with 35.3% in Zone 398 and 27.4% in Zone 406.

The other trips totaled 25.7% and should be considered significant.

Therefore, of all the 1963 auto driver trips entering Zones 398 and 406 more than 74% of them required some form of parking.

1990 ESTIMATED PARKING SPACE DEMAND

The 1990 estimated parking space demand (Table E-3) was calculated for both 1990 Transportation Plans A and C. The space estimating factor technique⁽²⁾ was employed to make these determinations.

An estimating factor value was determined for both study zones in Lowell. Zone 398 had a combined accumulation total of 3177 and a total zonal 'ins' of 14,585 making the factor value .218. Zone 406 had a factor value of .171 based on a total combined accumulation of 2437 and a total zonal 'ins' of 14,253. These value factors were then used to derive the 1990 estimated parking space demands for the study area.

The reduction of parking space demand in 1990 for the two study zones was due to the technique employed to project and distribute trips. This technique assumed that the trends of 1952 to 1963 would continue, thereby producing a decrease of more than 20% in the two zones for 1990. Analysis of the 1990 auto driver trips to the entire city revealed the park-

(2) See Chapter III for details of method

ing space demand increased by more than 12%. This city wide increase reflects that commercial and industrial activities are projected to increase in the city but not in the two downtown zone study areas.

TABLE E-3

LOWELL

1990 ESTIMATED PARKING SPACE DEMAND

ZONE	COMBINED FACTOR VALUE	ESTIMATED DEMANDS		
		1963	1990A	1990C
398	.218	3177	2572	2522
406	.171	2437	1779	1766
TOTAL		5614	4351	4288

What can be anticipated as 1990 parking demand will depend on any future change and physical condition of the study area.

Three possibilities exist:

1. The 1990 demand will decrease as indicated if nothing is done to strengthen Zones 398 and 406.
2. The 1990 demand will remain the same as the 1963 demand if this study area continues to operate and strengthen its position by minor improvements and replacements.
3. The 1990 demand will increase with the undertaking of vast redevelopment programs. If this step were

undertaken, then it is recommended that the parking situation be considered as a major element of any redevelopment program.

Based on the possibility that parking in the selected study areas will decrease in 1990, it is recommended that detailed studies be made of the present parking situation along with the study of the physical and economic condition of the downtown area.

APPENDIX F

LYNN

INTRODUCTION

The city of Lynn, located to the northeast of Boston, had a 1960 population of 94,478. The major employer in Lynn is the General Electric Company.

The area to be analyzed consists of two zones - 288 and 296. The activity in Zone 288 is primarily due to General Electric Company, while Zone 296 might be considered to represent the central business area. The auto driver trips attracted by these two zones represent 44% of all the auto driver trips in Lynn which required some form of parking.

Three other zones (289, 294, 295) indicated attraction strengths; however, their large size precluded any realistic analysis. (See map)

1963 HOURLY PARKING SPACE DEMAND

The auto accumulation⁽¹⁾ method was used to estimate 1963 parking space demand for Zones 288 and 296 in Lynn. The hourly peak demands were calculated from the 'in' and 'out' auto driver trips as indicated on Graphs F-1 and F-2.

In both zones the highest accumulation by work trips occurred at 2:00 PM, Zone 288 with a demand of 6696 spaces and Zone 296 with 3215 spaces. The non-work peaks did not occur in the same time period. The peak non-work demand for Zone 288 was 645 spaces at 7:00 PM while the demand in Zone 296 was 655 spaces at 8:00 PM. The combined zonal peaks were 6892 at 2:00 PM for Zone 288 and 3838 at 1:00 PM for Zone 296. Therefore, the 1963 hourly parking space demand for the two zones was 6802 and 3838 for a combined total of 10640.

1963 PARKING TYPE USAGE


The total 1963 24 hour parking space usage for the combined zones in Lynn was 29,483. Of this total 73.3% was off-street lot parking and 26.2% was on-street parking. Garage parking was negligible with 0.5%. (Table F-1)

The 93.8% lot usage in Zone 288 indicates the effect General Electric Company or an industrial complex has on parking requirements. The distribution of usage by type is more typical in Zone 296 (Street 45.6%, Lot 54.1%) reflecting

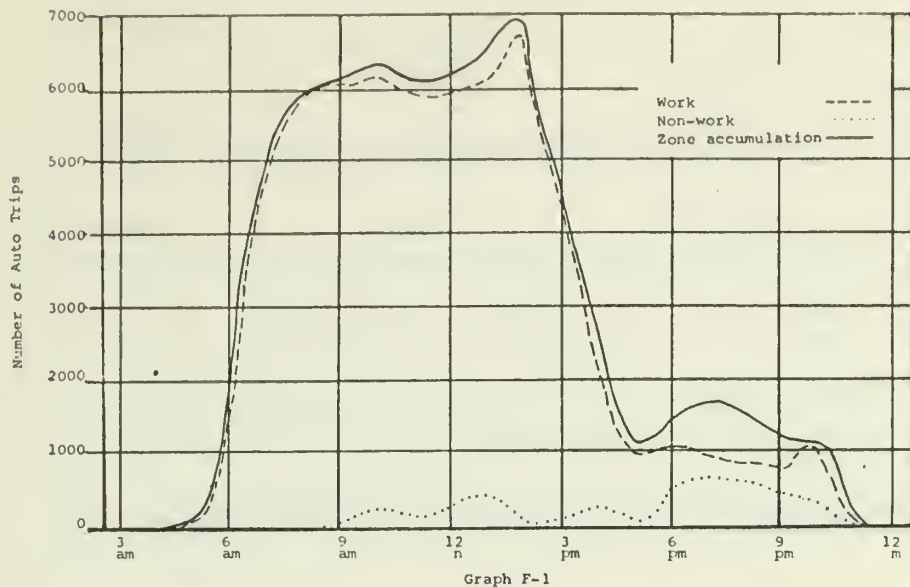
(1) For details on Methodology, see Chapter III

CITY OF
LYNN
MASSACHUSETTS
1965

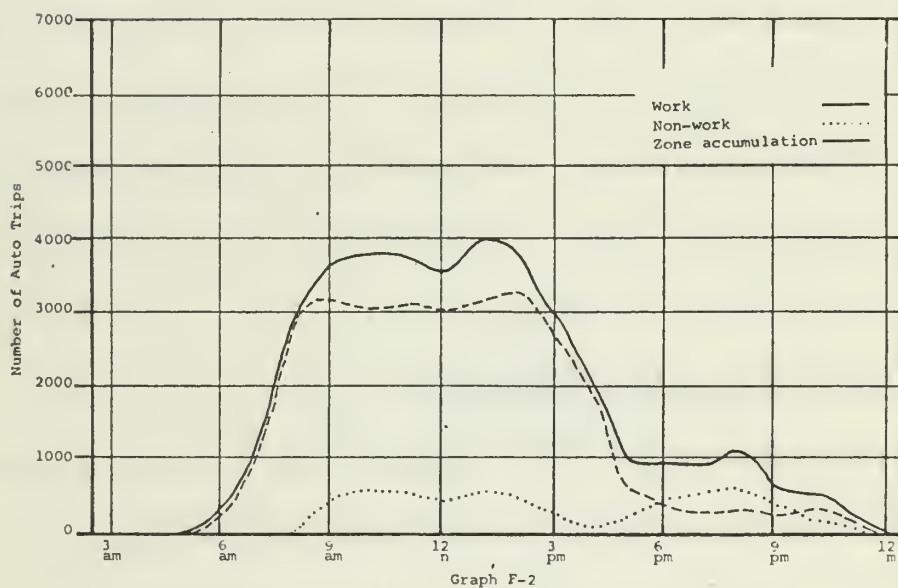
City Engineer's Office, Lynn, Mass.
Joseph J. Macaione, City Engineer

Study Zones 





1963 AUTO TRIP ACCUMULATION BY PURPOSE



1963 AUTO TRIP ACCUMULATION BY PURPOSE

its function as a central business area.

TABLE F-1
LYNN

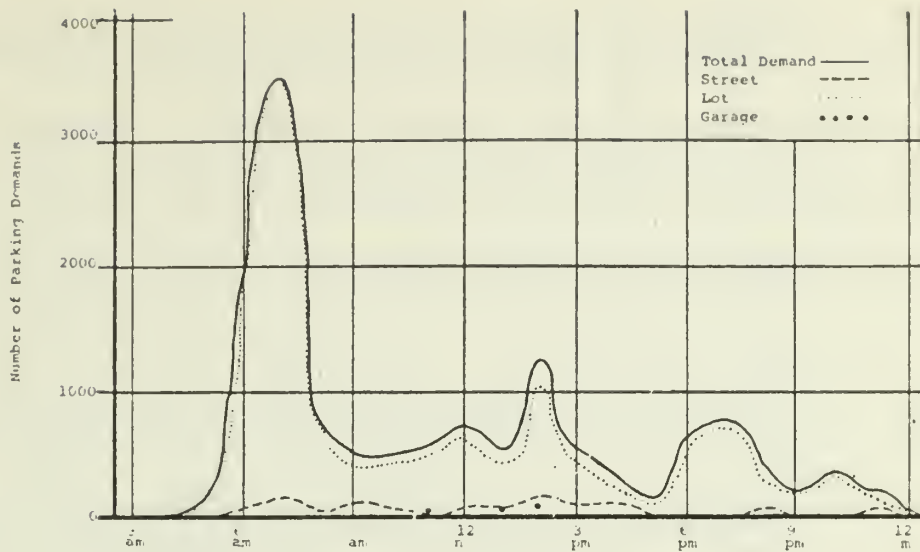
1963 24 HOUR PARKING USAGE BY TYPE

Zone	STREET			LOT			GARAGE			TOTAL
	Free	Paid	Total	Free	Paid	Total	Free	Paid	Total	
288	778	-	778	12679	714	13393	76	35	111	14282
%	5.4	-	5.4	88.8	5.0	93.8	.5	.3	.8	
296	3465	3469	6934	7204	1027	8231	36	-	36	15201
%	22.8	22.8	45.6	47.4	6.7	54.1	.3	-	.3	
TOTAL	4243	3469	7712	19883	1741	21624	112	35	147	29483
%	14.4	11.8	26.2	67.4	5.9	73.3	.4	.1	.5	

Graphs F-3 and F-4 portray the hourly usage peaks by parking type for zones 288 and 296. Three peaks appeared in Zone 288 at 7:00 AM, 2:00 PM and 7:00 PM, while two peaks - 8:00 AM and 10:00 PM - occurred in Zone 296. The most extreme peak occurred in Zone 288 at 7:00 AM reflecting the need for work purpose parking. The peaks in Zone 296 were moderate with a more consistent level of demand reflecting the area's business purpose activities.

PURPOSE OF TRIPS THAT PARKED

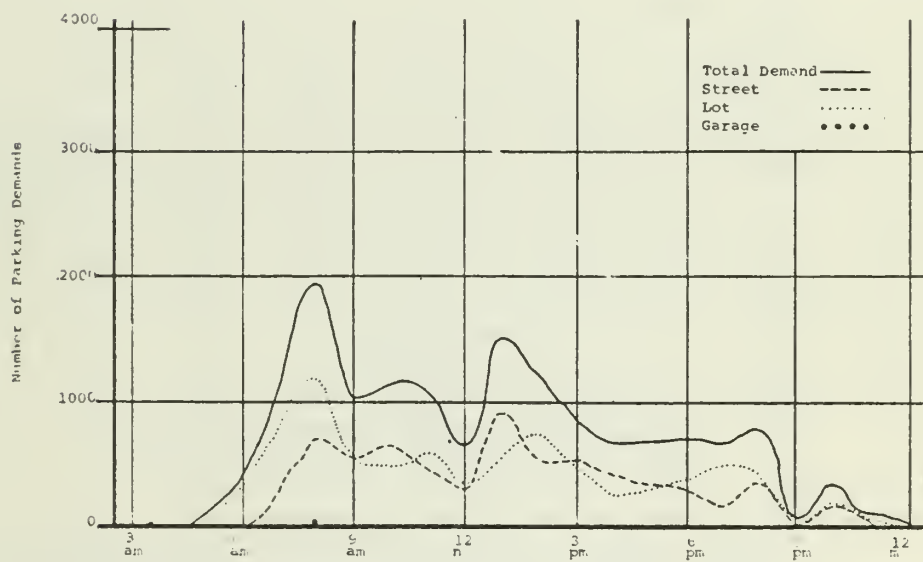
The study of trips by purpose to Zones 288 and 296 revealed that the combined total was 16,206 work vs. 13,723 non-work. When the hourly 'ins' are plotted as in Graphs F-5 and F-6, the major work trip peak occurs at 7:00 AM in Zone 288 with a lesser peak at 2:00 PM. In Zone 296 the



Graph F-3

LYNN (288)

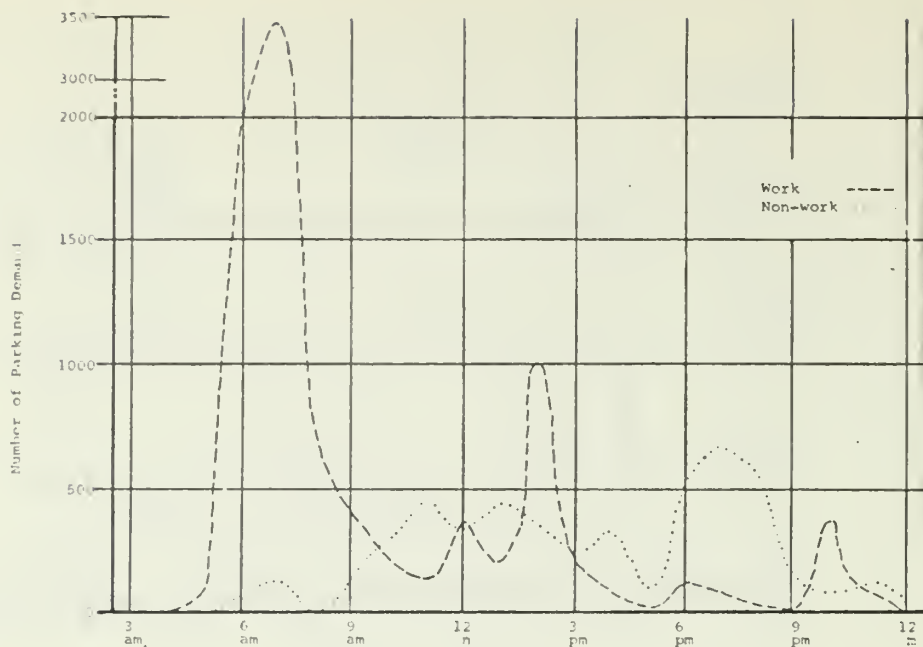
1963 HOURLY PARKING DEMAND BY PARKING TYPE



Graph F-4

LYNN (296)

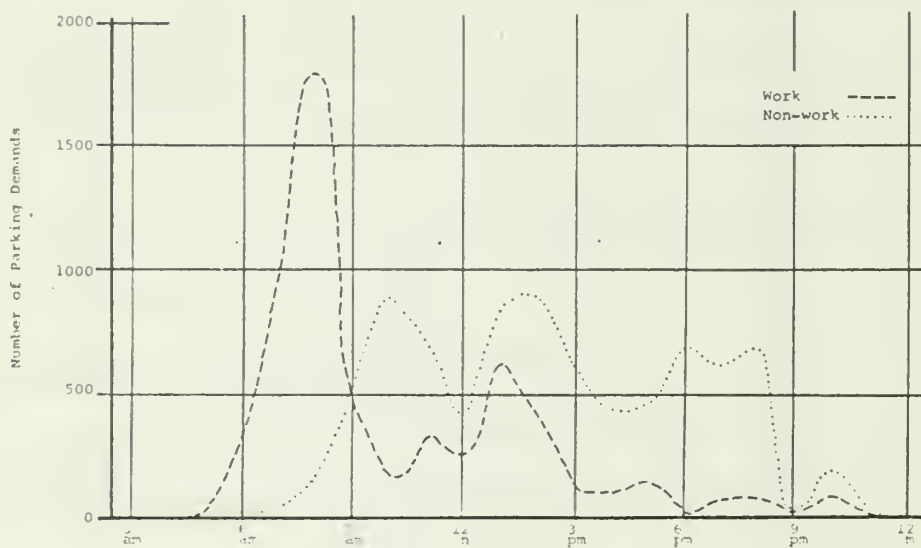
1963 HOURLY PARKING DEMAND BY PARKING TYPE



Graph F-5

LYNN (296)

1963 HOURLY PARKING DEMAND BY PURPOSE



Graph F-6

LYNN (296)

1963 HOURLY PARKING DEMAND BY PURPOSE

largest peak occurs at 8:00 AM and a lesser peak at 1:00 PM. The non-work trips have several peaks indicating a more consistent level of parking demand. The peak for non-work trips occurs at 2:00 PM in Zone 296 and at 7:00 PM in Zone 288.

Trip characteristics were further tabulated by eight purpose categories (Table F-2). Total work trips in the two zones amounted to 44.2% of the total trips while the combined non-work trips amounted to 37.4%. The 'other' trips represented 18.4%.

Individually Zone 288 had 56.4% work trips vs. 29.1% combined non-work trips. Zone 296 had 33.2% work trips vs. 44.8% combined non-work. Of the non-work categories, Shopping GAF had the greatest activity for both zones. School trips for both zones were negligible. 'Other' trips were not significant in Zone 288 with only 14.3%; however, Zone 296 indicated 21.9% showing some significance.

TABLE F-2
LYNN

1963 TRIPS BY PURPOSE TO ZONES

ZONE	WORK	NON-WORK						OTHER	GRAND TOTAL
	Work 1	Per Bus. 2	Rec. 3	Sch. 4	Soc. 5	Conv. 7	Shop GAF 8	Non- Work Total 0-6-9	
288	9759	1367	876	-	153	1113	1532	5041	17289
%	56.4	7.9	5.0	-	.8	6.4	8.8	29.1	14.3
296	6447	2960	675	125	775	980	3167	8682	19376
%	33.2	15.2	3.4	.6	3.9	5.0	16.3	44.8	21.9
TOTAL	16206	4327	1551	125	928	2093	4699	13723	36665
%	44.2	11.8	4.2	.3	2.5	5.7	12.8	37.4	18.4

Therefore, of all the 1963 auto driver trips entering Zones 288 and 296 more than 81.6% of them required some form of parking.

1990 ESTIMATED PARKING SPACE DEMAND

The 1990 estimated parking space demand (Table F-3) was calculated for both 1990 Transportation Plans A and C. The space estimating factor technique⁽²⁾ was employed to make these determinations.

TABLE F-3

LYNN

1990 ESTIMATED PARKING SPACE DEMAND

ZONE	COMBINED FACTOR VALUE	ESTIMATED DEMAND		
		1963	1990A	1990C
288	.393	6802	6080	6097
296	.198	3838	2251	2292
TOTAL		10640	8331	8389

The study area in Lynn consisted of two zones; therefore an estimating factor value was determined for each. Zone 288 had a combined accumulation of 6802 and a total zonal 'ins' of 17,289 making the factor value .393. Zone 296 had a factor value of .198 based on a combined accumulation of 3838 and a total zonal 'ins' of 19,376. These factor values were then used to derive the 1990 estimated parking space demands for the study area.

(2) See Chapter III for details of method

The reduction of parking space demand in 1990 for the two study zones was due to the technique employed to project and distribute trips. This technique assumed that the trends of 1952 to 1963 would continue thereby producing a decrease of more than 20% in the two zones for 1990. The analysis of the city as a whole also revealed a decrease in parking demand of 109 spaces based on 1990 auto driver trips. This total community decrease reveals that in the future Lynn will play a smaller role as a sub-center of commercial and business activity for the EMRPP region.

APPENDIX G

QUINCY

INTRODUCTION

The city of Quincy, located south of Boston, had a 1960 population of 87,409. The city serves as a shopping and business area for the many southern coastal communities. Quincy, the birthplace of two of our Presidents, has many historic landmarks. The outstanding industry in the city is the Fore River Ship Yard employing persons from all over Eastern Massachusetts. The city also has an important natural resource, "Quincy Granite", which is still quarried.

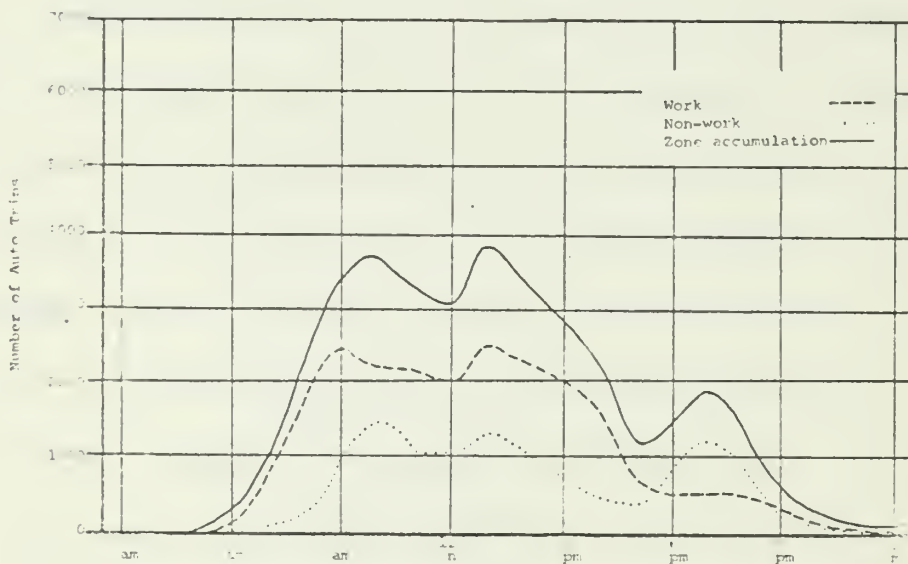
The area selected for study was Zone 554. This zone contains the majority of Quincy's shopping and business activities. More than 27% of all auto driver trips in the city requiring parking are attracted to Zone 554. The resurgence of this area is the result of a revitalization program by merchants and city officials several years ago. By providing off-street parking in the rear of the existing stores,

, not only was the downtown shopping complex saved but in effect a downtown shopping plaza or center was created.

Although the 1963 data did not indicate Zones 563, 564 and 565 to be major attractors, the recent growth of activities at General Dynamics Shipyards would indicate possible parking demand problems in the future. Presently the parking is in off-street lots; however, with the added development pressures this situation may change.

1963 HOURLY PARKING SPACE DEMAND

The auto accumulation method was used to estimate 1963 parking space demand for Zone 554 in Quincy. The hourly peak demands were calculated from the 'in' and 'out' auto driver trips and are shown on Graph G-1.



Graph G-1

QUINCY

1963 AUTO TRIP ACCUMULATION BY PURPOSE

MAP OF
— THE —
CITY OF QUINCY
NORFOLK COUNTY
MASSACHUSETTS
1964

SCALE OF FEET
Ernest W. Branch, Civil Engineer,
11 Adams Way
Quincy, Massachusetts
Robert S. Smith, Jr.
Quincy, Massachusetts
Placed in Quincy Office

MILTON

BOSTON

NEPONSET

DORCHESTER BAY

Study Zone

QUINCY BAY

BRAINTREE

WEYMOUTH

MAP 17

The highest auto accumulation by work trips occurred at 1:00 PM showing a demand for 2497 spaces. The zone peak of the 1963 hourly parking demand for Zone 554 was at 1:00 PM requiring 3873 spaces. This zonal peak is determined by summing the hourly work and non-work peaks.

1963 PARKING TYPE USAGE

The total 1963 24 hour parking space usage for Zone 554 was 17,506. Of this total 45.6% was on-street and 53.8% was off-street. Garage parking in this zone was negligible at .6%.

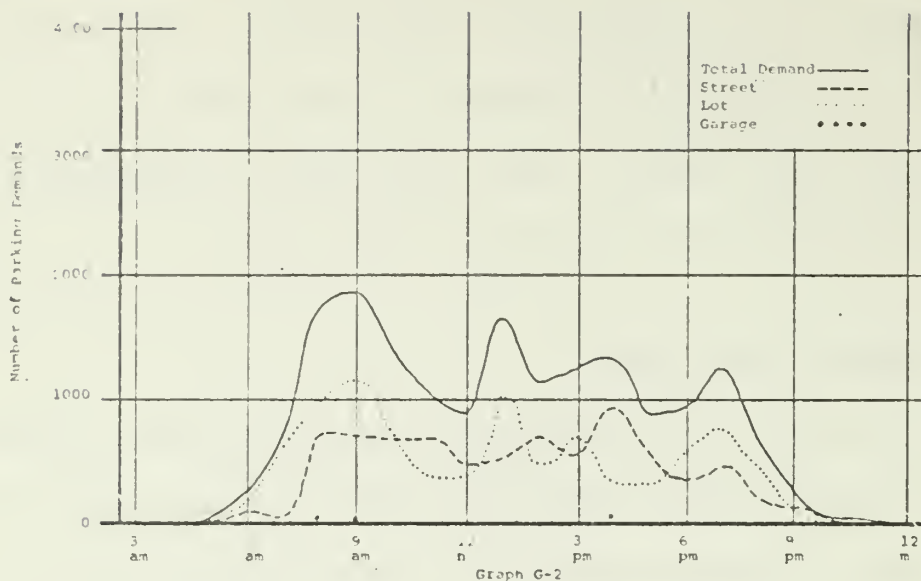
TABLE G-1

QUINCY

1963 24 HOUR PARKING USAGE BY TYPE

	STREET			LOT			GARAGE			GRAND
Zone	Free	Paid	Total	Free	Paid	Total	Free	Paid	Total	TOTAL
554	3370	4602	7972	8338	1089	9427	109	-	109	17506
%	19.3	26.3	45.6	47.6	6.2	53.8	.6	-	.6	

As shown in Graph G-2 the hourly usage by parking type indicates four descending peaks. The highest peak occurred at 9:00 AM, followed by peaks at 1:00 PM, 4:00 PM and 7:00 PM. The usage of on-street parking is nearly constant from 8:00 AM to 3:00 PM with the greatest peak at 4:00 PM, then declining sharply which reflects late afternoon short term parking.



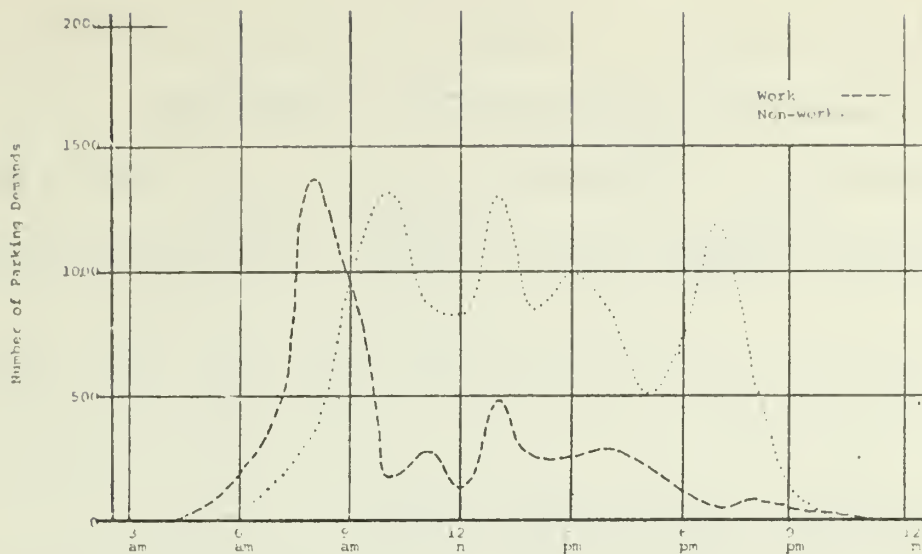
1963 HOURLY PARKING DEMAND BY PARKING TYPE

Massachusetts D.P.W., Bureau of Transportation Planning and Development

EMRPP

PURPOSE OF TRIPS THAT PARKED

The study of trips to Zone 554 by purpose revealed that of the 16,850 trips requiring parking 5,369 were work and 11,481 were non-work trips. When the hourly 'ins' are plotted as in Graph G-3, work trips have two distinct peaks, a major one at 8:00 AM and a minor one at 1:00 PM. The plotted non-work trips indicate four peaks, three of which are nearly equal at 10:00 AM, 1:00 PM and 7:00 PM and a lesser one at 3:00 PM.



Graph G-3
QUINCY
1963 HOURLY PARKING DEMAND BY PURPOSE

Massachusetts D.P.W., Bureau of Transportation Planning and Development

EMRPF

Trip characteristics were further tabulated by eight purpose categories (Table G-2). Work trips to Zone 554 constituted 25.5% of the zone's total, while the combined non-work categories amounted to 54.5%. Shopping GAF was the largest non-work category at 27.2% reflecting the importance of shopping in Zone 554. The 'other' trips at 19.9% of the total are not considered to be of real significance.

Therefore more than 80% of all auto driver trips entering Zone 554 required parking.

TABLE G-2

QUINCY

1963 TRIPS BY PURPOSE TO ZONE 554

ZONE	WORK	NON-WORK						OTHER	TOTAL
	Work 1	Per Bus 2	Rec 3	Sch 4	Soc 5	Shop Conv 7	Shop GAF 8	Non- Work Total 0-6-9	TOTAL
554	5369	2946	287	270	482	1758	5738	11481	21041
%	25.5	14.0	1.3	1.2	2.2	8.3	27.2	54.5	19.9

1990 ESTIMATED PARKING SPACE DEMAND

The 1990 estimated parking space demand (Table G-3) was calculated for both 1990 Transportation Plans A and C. The space estimating factor technique⁽²⁾ was employed to make these determinations.

TABLE G-3

QUINCY

1990 ESTIMATED PARKING SPACE DEMAND

ZONE	COMBINED FACTOR VALUE	ESTIMATED DEMAND		
		1963	1990A	1990C
554	.184	3873	2908	2931

The combined estimating factor value of .184 was determined by dividing the total zonal 'ins' (21041) into the combined accumulation total (3873) for Zone 554.

The 1990 estimated parking space demand was determined for Zone 554 by using the combined factor value.

(2) See Chapter III for details of method

The reduction of parking space demand in 1990 for Zone 554 was due to the technique employed to project and distribute trips. This technique assumed that the trends of 1952 to 1963 would prevail, thereby producing the 1990 decrease in Zone 554. However, the auto driver trips in 1990 for the whole city of Quincy increased by 17.3%.

With the possibility of decreasing parking demand, it is recommended that a detailed parking study be undertaken by the city. This study should be done in conjunction with a study of the present and future physical and economic condition of the central core area (Zone 554).

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